

FRAGRANCE FOR IMPROVING INVIGORATION STATE AND METHOD OF ASSESSING

The present invention relates to methods of assessing the ability of a test fragrance ingredient or a test fragrance composition to improve the invigoration state of a human subject and of creating fragrance compositions having an effect of improving the invigoration state of a human subject. It further relates to fragrance compositions for improving the invigoration state of a human subject, to consumer products comprising such fragrance compositions, and to methods of improving the invigoration state of a human subject.

Perfumery has been widely employed by consumer product companies in order to impart to their products pleasant, well-liked odours that promote consumer liking and which influence purchasing decisions for this reason.

However, in an increasingly competitive marketplace, mere liking is often not sufficient to differentiate one brand over its competitors. Accordingly, in the market execution of their products, consumer product companies frequently refer to wide-ranging product benefits, typically communicated through diverse advertising campaigns, as well as on the packaging and labelling of their products, which together form an important part of their branding strategy. New differentiating effects are constantly sought, and perfumery has often been employed as a means to achieve those effects. For example, perfumery has been employed to create real or perceived functional effects that may relate to cosmetic effects, hygiene effects, malodour-counteracting effects, and the like.

It has long been known that fragrance materials and essential oils can promote feelings of happiness and well-being. These materials have also been used in cosmetic products and aromatherapy in order to provide a similar effect.

Aroma-Chology® is a term coined by the Olfactory Research Fund Ltd. (see extensive review by J. Jellinek in *Cosmetics & Toiletries*, (1994) **109**, pp 83-101). It is concerned specifically with the temporary, beneficial psychological effects of aromas in human behaviours and emotions to improve mood and quality of life. In fact, a large number of products promoted as having aromatherapy benefits can be more accurately identified for their Aroma-Chology® benefits as they produce temporary psychological effects. However, there is no teaching as to how to formulate products to achieve such benefits qualitatively or quantitatively with a reliable expectation of success. In addition, it is well known that fragrances can be perceived as associated with different attributes in different countries.

More recently, several patent applications (e.g. WO 02/49600, WO 2008/050084, WO 2008/050086, WO 2020/165463) have focused on providing positive mood benefits through fragrance compositions, providing guidelines on how to measure these mood benefits and on how to create effective fragrance compositions.

5 For instance, WO 2008/050084 describes fragrance compositions, which promote activated, pleasant moods through the inhalation of an effective amount of energising, non-stressing fragrances (invigorating fragrances). WO 2008/050084 provides formulation guidelines specifying different types of fragrance ingredients (e.g. invigorating, relaxing or neutral ingredients) and the concentrations at which these fragrance ingredients may be present in the compositions in order
10 to achieve the desired effect. These formulation guidelines have been developed based on consumer testing.

WO 2008/050084 classifies fragrance ingredients into six categories: IMPU fragrance ingredients that strongly support invigorating moods; HMR fragrance ingredients that may support both happy and relaxing moods; HMI fragrance ingredients that may support both happy and invigorating
15 moods; HMP fragrance ingredients that are strongly associated with happy moods; RMP fragrance ingredients that strongly support relaxing moods; and GEN fragrance ingredients that may support a variety of moods.

However, there is a large group of other fragrance ingredients that have not been assigned to any of these six groups. Also, some fragrance ingredients are now longer used nowadays, either due
20 to regulatory restrictions or due to the availability of better alternatives.

There is therefore a need to classify further fragrance ingredients.

WO 2008/050084 uses consumer testing for assessing the influence of a fragrance composition on the mood and emotions of test subjects. However, consumer testing has several important drawbacks:

- 25 - Lack of any physiological information from the participant
- No information on implicit mental processes happening in the brain
- Explicit/declarative description of odours is much harder than other stimuli (e.g. the description of a picture), often resulting in inaccurate findings
- Participants are able to control the answers provided to a test and might alter their answers
30 to please the experimenter (a phenomenon known in the psychology literature as

- “participant bias”), leading to the collection of inaccurate data ([https://doi.org/10.1016/0191-8869\(86\)90014-0](https://doi.org/10.1016/0191-8869(86)90014-0))
- Difficulty to differentiate different mood states between samples
 - Ratings often correlate with liking scores
 - 5 - Tendency to acquiesce – answer positively
 - Tendency to be evasive – to opt for neutral, unsure, uncertain response
 - Tendency for speed – to complete the test quickly rather than accurately

It is therefore highly desirable that an improved technique for assessing the mood state of a human subject is developed, which allows for more flexibility during the measurement.

- 10 The above problems are solved by the present invention.

In a first aspect, the present invention provides a method of assessing the invigoration state of a human subject by means of fNIRS (functional near-infrared spectroscopy).

- 15 In a second aspect, the present invention provides a method of assessing the ability of a test fragrance ingredient or a test fragrance composition to improve the invigoration state of a human subject.

In a third aspect, the present invention provides a method of creating a fragrance composition having an effect of improving the invigoration state of a human subject.

In a fourth aspect, the present invention provides a fragrance composition for improving the invigoration state of a human subject.

- 20 In a fifth aspect, the present invention provides a consumer product comprising said fragrance composition.

In a sixth aspect, the present invention provides a method of improving the invigoration state of a human subject, comprising the step of providing an effective amount of the fragrance composition of the invention to the human subject.

- 25 In a seventh aspect, the present invention relates to the use of certain fragrance ingredients for improving the invigoration state of a human subject.

The use of functional near-infrared spectroscopy (fNIRS) for assessing the mood state, and in particular the invigoration state, of a human subject is highly advantageous: fNIRS is harmless, tolerant to bodily movements, and highly portable; it is also suitable for all possible participant

populations, from newborns to the elderly, and experimental settings, both inside and outside the laboratory (for a review, see: “The present and future use of functional near-infrared spectroscopy (fNIRS) for cognitive neuroscience”, Pinti et al., Ann. N.Y. Acad. Sci. 1464 (2020) 5–29). In particular, the use of fNIRS allows for in-context-testing, where participants are asked to perform specific tasks related to the fragrances provided to them (e.g. cleaning a hard surface while
5 smelling the fragrance of an all-purpose cleaner).

fNIRS is an optical, non-invasive neuroimaging technique that allows the measurement of brain tissue concentration changes of oxygenated (Oxy Hb or HbO₂) and deoxygenated (Deoxy Hb or HbR) haemoglobin following neuronal activation. This is achieved by shining NIR light (650–950
10 nm) into the head, and, taking advantage of the relative transparency of the biological tissue within this NIR optical window, light will reach the brain tissue. The most dominant and physiological-dependent absorbing chromophore within the NIR optical window is haemoglobin. Based on its saturation state, we can have haemoglobin in its oxygenated (HbO₂) and deoxygenated form (HbR). In particular, HbO₂ and HbR absorb the NIR light differently: HbO₂ absorption is higher for
15 $\lambda > 800$ nm; on the contrary, HbR absorption coefficient is higher for $\lambda < 800$ nm.

When a brain area is active and involved in the execution of a certain task, the brain’s metabolic demand for oxygen and glucose increases, leading to an oversupply in regional cerebral blood flow (CBF) to meet the increased metabolic demand of the brain. The oversupply in regional CBF produces an increase in HbO₂ and a decrease in HbR concentrations; these are estimated by
20 changes in light attenuation that can be measured by fNIRS.

The portion of tissue interrogated by the NIR light is called a channel and is located at the midpoint between the source optode (S) and the detector optode (D), and at a depth of around the half of the source–detector separation. To fully exploit the potential of fNIRS, multi-channel devices are used nowadays. These allow monitoring of larger portions of the head and the gathering of
25 topographic HbO₂ and HbR maps. Several multi-channel fNIRS devices are commercially available (e.g. Brite by Artinis, ETG-4100 by Hitachi or NIRSPort by NIRx).

The position of the fNIRS channels is generally standardized based on the EEG’s 10-20 system. Typical devices use about sixteen to twenty-two channels. Optodes (detectors and sources) must be placed in an alternate fashion (i.e. a source followed by a detector, followed by a source...)
30 typically in a grid with equal distances between the channels, e.g. at a distance of 3 cm (Pinti et al. (2019) “Current Status and Issues Regarding Pre-processing of fNIRS Neuroimaging Data: An Investigation of Diverse Signal Filtering Methods Within a General Linear Model Framework”,

Front. Hum. Neurosci. 12:505.). Both optodes and channels are typically numbered to allow for identification. For optodes, the letter S before the number typically defines a source optode, while the D letter before the number defines a detector optode. The numbers are usually progressive, e.g. from 1 to 8 for the sources and from 1 to 7 for the detectors.

5 In the methods of the present invention, the following set-up of the fNIRS channels was used:

The centre of fNIRS Channel 12 was placed on the standard position EEG channel FPz according to the EEG 10-20 system (Trambaioli et al. "Predicting affective valence using cortical hemodynamic signals", *Sci Rep* **8**, 5406 (2018)). Channel 12 is located between source S5 and detector D4, where S5 is situated 1.5 cm from the location of the EEG channel FPz towards the Nasion on the midline of the head, and D4 is situated 1.5 cm from the location of EEG channel FPz towards the Inion on the midline of the head. All fNIRS optodes are placed at a standardised distance of 3 cm one from one another and are arranged on gridlines extending parallel and orthogonally to the midline. Taking S5 and D4 as a reference, and considering a shift of 3 cm for each optode either on the Nasion-Inion direction (where "in front" means towards the Nasion and "behind" means towards the Inion) or on the Pre Auricular line (where "to the left" means towards the Left Pre Auricular line and "to the right" means towards the Right Pre Auricular Line), then S4 is behind D4, D5 on the right of S4, S7 on the right of D5, D7 in front of S7, S8 in front of D7, S6 on the left of D7, D6 on the left of S8, D2 on the left of S4, S3 on the left of D4, D3 in front of S3, S1 on the left of D2, D1 in front of S1 and S2 in front of D1. This setup is also shown in Figure 1.

20 The channel scheme is the following:

Channel Number	Position (Source – Detector)	Channel Number	Position (Source – Detector)
Channel 1	S1 – D1	Channel 11	S5 – D3
Channel 2	S1 – D2	Channel 12	S5 – D4
Channel 3	S2 – D1	Channel 13	S5 – D6
Channel 4	S2 – D3	Channel 14	S6 – D4
Channel 5	S3 – D1	Channel 15	S6 – D6
Channel 6	S3 – D3	Channel 16	S6 – D7
Channel 7	S3 – D4	Channel 17	S7 – D5
Channel 8	S4 – D2	Channel 18	S7 – D7
Channel 9	S4 – D4	Channel 19	S8 – D6
Channel 10	S4 – D5	Channel 20	S8 – D7

Thus, there are nine channels per hemisphere (left or right) and two channels at the midline of the frontal and prefrontal areas. Channels 1 to 8 and 11 are located in the left hemisphere, Channels

9 and 12 are on the midline, and Channels 10 and 13 to 20 are in the right hemisphere. Channels 9 and 12 are only considered for full brain analysis.

By means of extensive research, it has been found that certain areas of the brain, and in particular certain channels, can be used as indicators for assessing the invigoration state of a human subject. More specifically, an increase or decrease of Oxy Hb, Deoxy Hb and/or Total Hb (corresponding to the sum of Oxy Hb plus Deoxy Hb) in the left or right hemisphere, the full brain, or certain specific channels, at certain time points provides an indication as to whether the invigoration state of the human subject is increased or decreased or stays about the same. The details will be described in relation to the method outlined below, but equally apply to the general method of assessing the invigoration state of a human subject.

The above finding has been applied in the present invention to provide a method of assessing the ability of a test fragrance ingredient or a test fragrance composition to improve the invigoration state of a human subject.

Said method comprises the following steps:

- a) measuring a base invigoration state of one or more human test subject(s);
- b) providing the test fragrance ingredient or the test fragrance composition to the human test subject(s) for smelling;
- c) measuring a resulting invigoration state of the human test subject(s); and
- d) determining a difference between the resulting invigoration state and the base invigoration state for the human test subject(s).

The base invigoration state and the resulting invigoration state are measured by functional Near Infrared Spectroscopy (fNIRS) of the human test subject(s)' left brain hemisphere, right brain hemisphere, and full brain.

More specifically, the applicant has identified certain specific Channels, haemoglobin types and time points that are particularly indicative of the effect on the invigoration state of the human subject.

In order to measure the base invigoration state, the human test subject(s) may be provided with a non-fragranced sample, e.g. a piece of cotton or cloth or a sorbarod. A sorbarod is a small plastic pot containing a polyester absorbent fibre insert encased in polyethylene sleeve. The fragrance can be applied to the insert, which provides continuous refreshment of the fragrance over several assessments, and can be easily perceived when held close to the nose to smell.

Alternatively, it is also possible to measure a reference invigoration state, e.g. in the presence of a reference fragrance sample.

If more than one human test subjects are involved, results for the base invigoration state and the resulting invigoration state may be averaged prior to determining the difference. Alternatively, it is
5 also possible to determine the difference for each human test subject separately.

It has been found that the test fragrance ingredient or the test fragrance composition is able to improve the invigoration state of the human subject if Criterion A is met.

Criterion A requires that at least four out of the following ten conditions A1 through A10 are met:

- 10 A1. Channel 14 shows a statistically significant decrease of Total Hb after 30 seconds of smelling;
- A2. Channel 19 shows a statistically significant increase of Total Hb after 30 seconds of smelling;
- A3. Channel 17 shows a statistically significant decrease of Oxy Hb after 0-5 seconds of smelling;
- A4. Channel 4 shows a statistically significant increase of Total Hb after 0-5 seconds of smelling;
- 15 A5. Channel 5 shows a statistically significant increase of Total Hb after 0-5 seconds of smelling;
- A6. Channel 17 shows a statistically significant decrease of Oxy Hb after 0-10 seconds of smelling;
- A7. Channel 19 shows a statistically significant increase of Total Hb after 0-10 seconds of smelling;
- 20 A8. Channel 17 shows a statistically significant decrease of Oxy Hb after 5-10 seconds of smelling;
- A9. Channel 17 shows a statistically significant decrease of Total Hb after 5-10 seconds of smelling;
- 25 A10. Channel 18 shows a statistically significant decrease of Total Hb after 5-10 seconds of smelling.

As outlined above, Total Hb is the amount of total haemoglobin measured, Oxy Hb is the amount of oxygenated haemoglobin measured, and Deoxy Hb is the amount of deoxygenated haemoglobin measured.

Haemoglobin values for the left brain hemisphere correspond to the mathematical average of the
30 individual haemoglobin values of Channels 1 to 8 and 11, as defined above.

Haemoglobin values for the right brain hemisphere correspond to the mathematical average of the individual haemoglobin values of Channels 10 and 13 to 20, as defined above.

Haemoglobin values for the full brain correspond to the mathematical average of the individual haemoglobin values of all Channels 1 to 20, as defined above.

- 5 As outlined above, Channels 1 to 8 and 11 are located in the left brain hemisphere, Channels 9 and 12 are located on the midline, and Channels 10 and 13 to 20 are located in the right brain hemisphere.

- 10 The effect on haemoglobin levels (Total Hb, Oxy Hb, and Deoxy Hb) may vary over time. It was found that more accurate results can be obtained by analysing haemoglobin values for several different time periods, e.g. after 0-5 seconds, 0-10 seconds, 5-10 seconds, 10-15 seconds, 15-20 seconds, 10-20 seconds, 20-25 seconds, 25-30 seconds, or after 30 seconds. Interestingly, the 5-second blocks roughly correspond to the time of a full respiration cycle (inhalation + exhalation).

- 15 In general, when it comes to the definition of brain signatures for invigorating fragrances and considering the average activity of larger portions of the brain, shorter time intervals appear to be the most relevant. This is in contrast to what was found when assessing happy fragrances, where longer time intervals (and even the analysis of the full 30 seconds of exposure to the fragrance) appear pivotal to define the associated brain signatures.

Also, the left hemisphere appears to be more involved than the left one in the processing of invigorating fragrances.

- 20 At the single channel level, specific brain signatures for invigorating fragrances can be defined again in shorter/earlier time windows (comprised in the first ten seconds of exposure to a fragrance), with a much higher impact of OxyHb and TotalHb compared to DeoxyHb (which, in turn, appears to be more relevant in the definition of brain signatures for relaxing fragrances), and a higher involvement of the right hemisphere, and in particular, of channel 17.

- 25 Statistical significance is verified using a 2-tailed Student's t-test with a statistical significance threshold at 0.05.

- 30 Throughout this application, the terms "invigorating", "improving the invigoration state", "increasing the invigoration state", "enhancing the invigoration state", and "increasing invigoration" are used interchangeably. They are meant to express that a certain item, in particular a fragrance ingredient or fragrance composition or consumer product containing the same, has a positive, activating

mood enhancing effect on a human subject. In other words, they induce positive activated moods and emotions, such as invigorating (i.e. they make people feel invigorated).

This emotional territory has been defined typically by the model circumplex of affect where emotions were classified in terms of their level of valence (i.e. pleasantness) and arousal (i.e. degree of activation) involved (Posner J, Russell JA, Peterson BS. The circumplex model of affect: an integrative approach to affective neuroscience, cognitive development, and psychopathology. *Dev Psychopathol.* 2005; 17(3): 715-734. doi:10.1017/S0954579405050340), with invigorating moods represented by feeling alert and excited.

This emotional space has been found to further include positive activated emotions, such as focus, confidence, and motivation, to reflect those inner feelings of invigoration, and also highly activated emotions such as adventurous, daring, and energised.

Thus, the present application in general relates to the enhancement of high activated moods, positive activated emotions, including but not limited to, feelings of invigoration, such as adventurous, daring and energised, and inner activated feelings of focus, empowerment, confidence, and motivation.

Throughout this application, the terms “fragrance” and “perfume” are used interchangeably.

Furthermore, also the terms “(fragrance) ingredient” and “(fragrance) material” are used interchangeably. In the context of the present invention, the term “fragrance ingredient” refers to an ingredient that has the function of providing a noticeable and identifiable odour to the fragrance composition. Fragrance ingredients include highly performing ingredients intended for providing an intense olfactive impression, as well as less performing ingredients intended for providing a subtle olfactive impression.

The term “fragrance composition” relates to a mixture of two or more fragrance ingredients. It may optionally include one or more odourless or low-odour solvents and/or diluents, e.g. as a vehicle for a fragrance material.

Throughout this application, the terms “(human) test subjects” and “participants” are used interchangeably.

Preferably, several human test subjects are involved in the method of the invention, in order to get a more representative and reliable result, for example more than five, more than ten, more than

15, or even more. Results from several human test subjects may be averaged. Alternatively, they may also be summed up.

Furthermore, participants that indicate that they dislike a certain test fragrance ingredient or test fragrance composition may be excluded from the respective analysis.

5 The method of the present invention allows for a fast, simple and reliable assessment of the ability of a test fragrance ingredient or a test fragrance composition to improve the invigoration state of a human subject. Fragrances may be tested in wide variety of settings, from a non-motion laboratory setting to in-context testing. Furthermore, the method allows for detecting sub-conscious effects, thereby avoiding common issues of conscious methods (e.g. interrogation),
10 which often provide only limited and often inaccurate information due to dishonest responses, prior survey biases, and inarticulacy, for instance.

In order to qualify as an invigorating fragrance ingredient or fragrance composition, a test fragrance ingredient/composition must meet at least four out of the ten conditions A1 through A10. Preferably, at least five out of the ten conditions A1 through A10 are met, more preferably at least
15 six, and most preferably at least seven.

More specifically, the applicant has identified certain specific Channels, haemoglobin types and time points that are particularly indicative of the effect on the invigoration state of the human subject.

Therefore, in an embodiment, further at least one of further Criterion B and further Criterion C is
20 met.

Criterion B requires that at least four, more preferably at least five, and most preferably all six, out of the following six conditions B1 through B6 are met:

- B1. Deoxy Hb for the full brain shows a statistically significant decrease after 0-5 seconds of smelling;
- 25 B2. Deoxy Hb for the right brain hemisphere shows a statistically significant decrease after 0-5 seconds of smelling;
- B3. Total Hb for the full brain shows a statistically significant increase after 0-5 seconds of smelling;
- B4. Total Hb for the left brain hemisphere shows a statistically significant increase after 0-5
30 seconds of smelling;

- B5. Deoxy Hb for the left brain hemisphere shows a statistically significant decrease after 5-10 seconds of smelling;
- B6. Oxy Hb for the left brain hemisphere shows a statistically significant increase after 0-5 seconds of smelling.
- 5 Criterion C requires that at least eight, more preferably at least nine, and most preferably at least 10, out of the following 20 conditions A1 through A10 and C1 through C10 are met:
- A1. Channel 14 shows a statistically significant decrease of Total Hb after 30 seconds of smelling;
- A2. Channel 19 shows a statistically significant increase of Total Hb after 30 seconds of smelling;
- 10 A3. Channel 17 shows a statistically significant decrease of Oxy Hb after 0-5 seconds of smelling;
- A4. Channel 4 shows a statistically significant increase of Total Hb after 0-5 seconds of smelling;
- A5. Channel 5 shows a statistically significant increase of Total Hb after 0-5 seconds of smelling;
- A6. Channel 17 shows a statistically significant decrease of Oxy Hb after 0-10 seconds of
15 smelling;
- A7. Channel 19 shows a statistically significant increase of Total Hb after 0-10 seconds of smelling;
- A8. Channel 17 shows a statistically significant decrease of Oxy Hb after 5-10 seconds of smelling;
- 20 A9. Channel 17 shows a statistically significant decrease of Total Hb after 5-10 seconds of smelling;
- A10. Channel 18 shows a statistically significant decrease of Total Hb after 5-10 seconds of smelling;
- C1. Channel 19 shows a statistically significant increase of Deoxy Hb after 30 seconds of
25 smelling;
- C2. Channel 6 shows a statistically significant increase of Oxy Hb after 30 seconds of smelling;
- C3. Channel 19 shows a statistically significant increase of Oxy Hb after 30 seconds of smelling;
- C4. Channel 10 shows a statistically significant decrease of Total Hb after 30 seconds of smelling;
- 30 C5. Channel 11 shows a statistically significant increase of Deoxy Hb after 0-5 seconds of smelling;
- C6. Channel 20 shows a statistically significant increase of Deoxy Hb after 0-5 seconds of smelling;
- C7. Channel 8 shows a statistically significant increase of Oxy Hb after 0-5 seconds of smelling;

C8. Channel 20 shows a statistically significant increase of Deoxy Hb after 0-10 seconds of smelling;

C9. Channel 7 shows a statistically significant increase of Oxy Hb after 0-10 seconds of smelling;

5 C10. Channel 4 shows a statistically significant increase of Total Hb after 0-10 seconds of smelling.

In an embodiment, Criterion B and Criterion C are met.

Depending on how many of the conditions A1 through A10 are met, it is preferred that a greater number of conditions B1 through B6.

Therefore, in an embodiment, further Criterion D is met.

10 Criterion D requires:

- that at least seven, more preferably at least eight, and most preferably at least nine, out of the ten conditions A1 through A10 are met if zero or one out of the six conditions B1 through B6 are met;
- 15 - that at least five, more preferably at least six, and most preferably at least seven, out of the ten conditions A1 through A10 are met if two or three out of the six conditions B1 through B6 are met; and
- that at least four, more preferably at least five, and most preferably at least six, out of the ten conditions A1 through A10 are met if four, five or six out of the six conditions B1 through B6 are met.

20 Based on the above described method of assessment, it was possible to develop guidelines for creating fragrance compositions that have an effect of improving the invigoration of a human subject.

Therefore, the present invention also provides a method of creating a fragrance composition having an effect of improving the invigoration of a human subject, comprising the steps of:

- 25 (i) creating a test fragrance composition;
- (ii) assessing the ability of the test fragrance composition to improve the invigoration state of a human subject according to the method described above; and
- (iii) adjusting, if necessary, the test fragrance composition by adding and/or removing at least one fragrance ingredient and/or increasing and/or reducing the concentration of at

least one fragrance ingredient until the fragrance composition is found to improve the invigoration state of the human subject.

Therefore, it is first assessed whether or not the test fragrance composition provides an effect of increasing invigoration. Subsequently, if necessary, the composition is adjusted to create an improved fragrance composition.

Steps (ii) and (iii) may be repeated if necessary and/or desired.

Increasing the level of IMPU and/or HMI fragrance ingredients increases the likelihood that the fragrance composition would have a suitable character to deliver the invigoration benefit. Other ingredients reduce the likelihood that the benefit will be achieved, as their level in the fragrance composition is increased, e.g. RMP fragrance ingredients.

Therefore, in one embodiment, at least one IMPU fragrance material is added to the (test) fragrance composition in step (iii).

Alternatively or in addition, at least one HMI fragrance material is added to the (test) fragrance composition in step (iii).

Alternatively or in addition, at least one RMP fragrance material may be removed from the (test) fragrance composition in step (iii).

Alternatively or in addition, the concentration of at least one IMPU fragrance material may be increased in step (iii).

Alternatively or in addition, the concentration of at least one HMI fragrance material may be increased in step (iii).

Alternatively or in addition, the concentration of at least one RMP fragrance material may be reduced in step (iii).

It has been found that the following fragrance materials have an invigorating effect and are, thus, IMPU fragrance ingredients: aromatic-eucalyptus ingredients, aromatic-mint ingredients, aromatic-rosemary ingredients, citrus-lime ingredients, spicy-pepper ingredients, citrus-floral/lemon ingredients, lavandin oil, patchouli oil, clary sage oil, orange flower oil, guaiacwood oil, oakmoss oil, litsea cubeba oil, citral, benzyl 2-hydroxybenzoate (benzyl salicylate), 2-methyl-3-(4-(1-methylethyl)phenyl)propanal (cyclamen aldehyde), 3-(4-ethylphenyl)-2,2-dimethyl-

propanal (floralozone), prop-2-enyl 2-(3-methylbutoxy)acetate (allyl amyl glycolate), prop-2-enyl 2-cyclohexyloxyacetate (cyclogalbanate), 4-methyl-2-(2-methylprop-1-en-1-yl)tetrahydro-2H-pyran (rose oxide), 1-[(2Z,5Z,9Z)-2,6,10-trimethylcyclododeca-2,5,9-trien-1-yl]ethanone (trimofix O or cyclisone), methyl 2,4-dihydroxy-3,6-dimethylbenzoate (Evernyl or Everniate), 2,6-dimethylheptan-2-ol (dimetol), 3,7-dimethylocta-1,6-dien-3-yl acetate (linalyl acetate) fir balsam oil, pine needle base, and mixtures thereof.

It has been found that the following fragrance materials have a happy-invigorating effect and are, thus, HMI fragrance ingredients: citrus-orange ingredients, citrus-mandarin ingredients, 1-(2-tert-butylcyclohexyl)oxybutan-2-ol (amber core), (3aR,5aS,9aS,9bR)-3a,6,6,9a-tetramethyl-2,4,5,5a,7,8,9,9b-octahydro-1H-benzo[e][1]benzofuran (ambrofix or ambroxan), 1,5,5,9-tetramethyl-13-oxatricyclo(8.3.0.0.(4.9))tridecane (cetalox or fixambrene), 2,6-dimethyloct-7-en-2-ol (dihydromyrcenol), 3-(1,3-benzodioxol-5-yl)-2-methylpropanal (helional or tropional), (2-tert-butylcyclohexyl) acetate (agrumex), 1-(2,6,6-trimethyl-1-cyclohex-2-enyl)but-3-en-1-one (damascone alpha), 2,4-dimethyl-3-cyclohexene-1-carbaldehyde (cyclal C or tricyclal or ligustral), 4-allyl-2-methoxyphenol (eugenol), and mixtures thereof.

It has been found that the following fragrance materials have a relaxing effect and are, thus, RMP fragrance ingredients: 2-(4-methylcyclohex-3-en-1-yl)propan-2-ol (terpineol), hexyl 2-hydroxybenzoate (hexyl salicylate), jasmin oil, 7-hydroxy-3,7-dimethyloctanal (hydroxycitronellal), 3-methyl-5-phenylpentanol (Mefrosol), 2-(phenoxy)ethyl 2-methylpropanoate (phenoxyethyl isobutyrate), (12E)-1-oxacyclohexadec-12-en-2-one (Habanolide), 4-methoxybenzaldehyde (aubepine para cresol, anisic aldehyde), benzoin resinoids, 3-ethoxy-4-hydroxybenzaldehyde (ethyl vanillin), 4-hydroxy-3-methoxybenzaldehyde (vanillin), 2-ethyl-4(2',2',3'-trimethylcyclopent-3-enyl)but-enol (Bangalol or Radjanol), mixtures of 2-methyl-1-phenylpropan-2-yl butanoate and (phenoxy)ethyl 2-methylpropanoate (Prunella), and mixtures thereof.

Where trivial names are used to describe useful perfume ingredients herein, the skilled perfumer will understand that these are commonly used names in the art of perfumery. However, the skilled perfumer would also understand that these ingredients may also be known by other trivial synonyms, by CAS registry numbers, or by more formal nomenclature, such as IUPAC nomenclature. Furthermore, the skilled perfumer would be familiar with these other trivial synonyms, as well as with more formal nomenclature, or at the least, would be aware of standard reference works, such as The Good Scents Company website, which contains a comprehensive list of trivial names, registry numbers and more formal nomenclature for the perfume ingredients contained in the perfumers' palette.

Perfume compositions and individual perfume ingredients may be characterized by their odour attributes. Although perfume creation is part science and part artistry, and there is no absolute prescribed definition for odour attributes of perfume compositions and perfume ingredients, nevertheless trained perfumers, realizing that there will be margin for some subjectivity, will be able to assign perfume compositions and ingredients to a general odour descriptor and an odour family.

Odour families provide a general description of an odour space, and their number is usually limited. Hence, most of the ingredients used in perfumery and particularly useful in the context of the present invention may be described by a small set of odour families selected from the group consisting of "aldehydic", "ambery", "animalic", "aromatic/herbal", "citrus", "earthy", "floral", "fruity", "green", "musky", "roasted", "spicy", "sweet", "watery", and "woody".

Odour descriptors provide a more accurate description of the odour of a perfume composition or ingredient within a family. They are more abundant and their number and diversity is often unlimited. Examples of odour descriptors include, but are not limited to, "aldehyde zest", "almond", "amber dry", "amberggris", "anis tarragon", "apple", "armoise", "balsam", "banana", "blackcurrant", "butter", "candied fruit", "caraway seed", "cedar", "cinnamon", "citronella", "clove", "cocoa", "coconut", "coniferous", "cooked sugar", "copaiba", "coriander leaf", "cucumber", "eucalyptus", "fecal", "floral-lemon", "freesia", "galbanum", "grapefruit", "grass", "heliotrope", "jasmine", "lavender", "leaf", "leather", "lemon", "licorice-fenugreek", "lily of the valley", "lime", "liquor", "lychee", "mandarin", "mango", "medicinal", "melon", "metallic", "milk cream", "mint", "molasses", "moss", "mushroom", "musk", "musk tonkin", "nut", "orange", "orange flower", "orris", "passionfruit", "patchouli", "peach", "pear", "pepper", "pineapple", "raspberry", "rhubarb", "rose", "rosemary", "sandalwood", "sea water", "solar", "strawberry", "terpenic", "thyme", "tonka", "vanilla", "vetiver", "violet", and "wax".

This selection of odour families and odour descriptors allows the skilled perfumer to characterize the odour of all perfume ingredients contained in the perfumer's palette. Nevertheless, for the trained perfumer, reading the contents of this specification as a whole together with their common general knowledge, it would not present undue burden to modify part or all of this vocabulary around which there is subjectivity, and such modification would not impact the selection of perfume ingredients useful to positively impact the perception of well-being.

Specific examples of aromatic-eucalyptus ingredients, aromatic-mint ingredients, aromatic-rosemary ingredients, citrus-lime ingredients, spicy-pepper ingredients, citrus-floral/lemon

ingredients, citrus-orange ingredients, and citrus-mandarin ingredients, respectively, will be provided below.

Throughout this application, the term "oil" is meant to encompass fully natural essential oils and extracts, as well as oils derived from natural essential oils and extracts, and modified essential oils and extracts that may comprise additional ingredients; irrespective of the extraction method. The term "oil" is meant to further also encompass any reconstitution or mixture of ingredients that provides a similar odour impression to the corresponding essential oil.

As used throughout this application, the term "terpineol" refers to single isomers of terpineol (e.g. alpha terpineol), as well as to mixtures of two or more isomers of terpineol.

The present invention further provides fragrance compositions for improving the invigoration state of a human subject.

The fragrance composition comprises at least 75%, preferably at least 85%, of fragrance ingredients drawn from the following groups:

- a) at least three IMPU fragrance ingredients;
- b) at least about 10% by weight in total of IMPU fragrance ingredients;
- c) optionally up to about 90% by weight in total of HMR, HMI, HMP, RMP and/or GEN fragrance ingredients, provided the following conditions are met:
 - (c1) $\text{IMPU} \geq \text{HMP} + \text{HMR}$
 - (c2) $\text{IMPU} + \text{HMI} + \text{GEN} \geq 65\%$;
 - (c3) $(\text{IMPU} + \text{HMI}) / (\text{IMPU} + \text{HMI} + \text{RMP} + \text{HMR}) \geq 0.7$
 - (c4) $\text{IMPU} / (\text{IMPU} + \text{HMP} + \text{RMP}) \geq 0.5$
 - (c5) $\text{IMPU} / (\text{HMP} + \text{RMP} + \text{IMPU}) + (100 - \text{TOTAL}) \geq 0.3$

In the above formulation guidelines, all percentages are based on total weight of the fragrance ingredients constituting the fragrance composition. This means that solvents, diluents and other odourless vehicles are not taken into account in the calculation.

IMPU indicates the sum of percentages of IMPU fragrance ingredients; HMP indicates the sum of percentages of HMP fragrance ingredients; HMR indicates the sum of percentages of HMR fragrance ingredients; HMI indicates the sum of percentages of HMI fragrance ingredients; RMP indicates the sum of percentages of RMP fragrance ingredients; GEN indicates the sum of percentages of GEN fragrance ingredients; and TOTAL indicates the sum of HMPs, HMRs, HMIs,

IMPU, RMPs, and GENs; provided that low odour or no odour solvents, diluents and other vehicles are excluded from the calculation of these sums.

The symbol $\geq$ indicates at least equal to.

5 The present invention is based on extensive testing of fragrance materials, by consumer testing and measurement of brain activity using fNIRS. Statistical analysis of the resulting data has allowed classifying the fragrance materials into different categories:

- IMPU comprises ingredients that strongly support invigorating moods;
- HMP comprises ingredients or bases strongly associated with happy moods;
- HMR comprises ingredients that may support both happy and relaxing moods;
- 10 - HMI comprises ingredients that may support both happy and invigorating moods;
- RMP comprises ingredients that strongly support relaxing moods and/or negatively impact happy and invigorating moods; and
- GEN comprises ingredients that may support a variety of moods.

15 It must be emphasized that these designations are relevant to ingredients as used by one skilled in the art (e.g. a perfumer) under the dosage and pattern constraints disclosed here.

The IMPU fragrance ingredients are selected from the group consisting of aromatic-eucalyptus ingredients, aromatic-mint ingredients, aromatic-rosemary ingredients, citrus-lime ingredients, spicy-pepper ingredients, citrus-floral/lemon ingredients, lavandin oil, patchouli oil, clary sage oil, orange flower oil, guaiacwood oil, oakmoss oil, litsea cubeba oil, citral, benzyl 2-hydroxybenzoate (benzyl salicylate), 2-methyl-3-(4-(1-methylethyl)phenyl)propanal (cyclamen aldehyde), 3-(4-ethylphenyl)-2,2-dimethylpropanal (floralozone), prop-2-enyl 2-(3-methylbutoxy)acetate (allyl amyl glycolate), prop-2-enyl 2-cyclohexyloxyacetate (cyclogalbanate), 4-methyl-2-(2-methylprop-1-en-1-yl)tetrahydro-2H-pyran (rose oxide), 1-[(2Z,5Z,9Z)-2,6,10-trimethylcyclododeca-2,5,9-trien-1-yl]ethanone (trimofix O or cyclisone), methyl 2,4-dihydroxy-3,6-dimethylbenzoate (Evernyl or Everniate), 2,6-dimethylheptan-2-ol (dimetol), 3,7-dimethylocta-1,6-dien-3-yl acetate (linalyl acetate) fir balsam oil, pine needle base, and mixtures thereof.

Aromatic-eucalyptus ingredients include, but are not limited to, e.g. eucalyptus oil, and 1-8 cineol (eucalyptol).

30 Aromatic-mint ingredients include, but are not limited to, e.g. peppermint oil, spearmint oil, L- and D/L-2-isopropyl-5-methylcyclohexanol (L- and DL-menthol), [(1R,2S,5R)-5-methyl-2-propan-2-ylcyclohexyl] acetate (menthyl acetate), 2-butan-2-ylcyclohexan-1-one (freskomenthe), 5-methyl-

2-prop-1-en-2-ylcyclohexan-1-ol (isopulegol), D/L- and L-2-isopropyl-5-methylcyclohexanone (D/L- and L-menthone), and L- and D/L-2-isopropyl-5-methylcyclohexanone (L- and racemic isomenthone).

Aromatic-rosemary ingredients include, but are not limited to, e.g. rosemary oil, (1R,2S,4R)-1,7,7-trimethylbicyclo[2.2.1]heptan-2-ol (borneol), (1R,4S,6R)-1,7,7-trimethylbicyclo[2.2.1]heptan-6-ol (iso-borneol), 1,7,7-trimethylbicyclo[2.2.1]heptan-2-one (camphor), 8,8-dimethyl-9-propan-2-yl-6,10-dioxaspiro[4.5]decane (opalal), 2-(5-methyl-5-vinyltetrahydro-2-furanyl)-2-propanol (linalool oxide), trans-methyl 1,4-dimethyl-cyclohexanecarboxylate (cyprisate), 2-ethenyl-2,6,6-trimethyloxane (limetol), and 2-butyl-4,4,6-trimethyl-1,3-dioxane (herboxane).

Citrus-lime ingredients include, but are not limited to, e.g. lime oil, lime terpenes, lime oxide, 1-methyl-4-(prop-1-en-2-yl)cyclohex-1-ene (dipentene), 1-methyl-4-propan-2-ylidenecyclohexene (terpinolene), (E)-3,7-dimethylocta-1,3,6-triene (ocimene), 1,1-diethoxy-3,7-dimethylocta-2,6-diene (citrathal), elemi oil, (4-methyl-1-isopropylbenzene (para-cymene), and 3,7,7-trimethylbicyclo[4.1.0]hept-3-ene (delta-3-carene).

Spicy-pepper ingredients include, but are not limited to, e.g. ginger oil, nutmeg oil, olibanum oil, cardamom oil, copaiba balsam oil, curcuma oil, pepper oil, and (4Z)-4,11,11-trimethyl-8-methylenebicyclo[7.2.0]undec-4-ene (caryophyllene).

Citrus-floral/lemon ingredients include, but are not limited to, e.g. bergamot oil, coriander oil, and coriander seed oil.

Pine needle base is a reconstitution of, i.e. a mixture of fragrance ingredients resembling the smell of, pine needle.

The HMP fragrance ingredients are selected from the group consisting of fruity-candied fruit ingredients (excluding damascone alpha), fruity-strawberry ingredients, fruity-raspberry ingredients, fruity-pineapple ingredients, grapefruit oil, 6,6-dimethoxy-2,5,5-trimethylhex-2-ene (methyl pamplemousse), hexenyl-3-salicylate, ylang ylang oil, ethyl 3-oxobutanoate (ethyl acetoacetate), 5-hexyloxolan-2-one (gamma decalactone), 5-octyloxolan-2-one (dodecalatone gamma), 2,2,5-trimethyl-5-pentylcyclopentan-1-one (veloutone), hexyl acetate, cassis base, 1-phenylethyl acetate (styrallyl acetate), (E)-4-methyldec-3-en-5-ol (undecavertol), 2-ethyl-3-hydroxypyran-4-one (ethyl maltol), 8-methyl-1,5-benzodioxepin-3-one (calone), 1-[(1R,2R,5S,7R)-2,6,6,8-tetramethyl-9-tricyclo[5.3.1.0^{1,5}]undec-8-enyl]ethanone (methyl cedryl ketone or vertofix coeur), and mixtures thereof.

Fruity-candied fruit ingredients (excluding damascone alpha) include, but are not limited to, e.g. (E)-1-(2,6,6-trimethylcyclohexa-1,3-dien-1-yl)but-2-en-1-one (damascenone), dimethyl benzyl carbonyl butyrate, (E)-1-(2,6,6-trimethyl-1-cyclohexenyl)but-2-en-1-one (damascone beta), (E)-1-(2,2-dimethyl-6-methylidenecyclohexyl)but-2-en-1-one (damascone gamma), (E)-1-(2,6,6-trimethyl-1-cyclohex-3-enyl)but-2-en-1-one (damascone delta), tagetes oil, ethyl 2-ethyl-6,6-dimethylcyclohex-2-ene-1-carboxylate (givescone), ethyl 2,6,6-trimethylcyclohexa-1,3-diene-1-carboxylate (ethyl safranate), ethyl 2,6,6-trimethylcyclohexa-1,3-diene-1-carboxylate (cristalon), (2E,5Z)-5,6,7-trimethylocta-2,5-dien-4-one (pomeroose), and (3 α ,4 β ,7 β ,7 α)-octahydro-4,7-methano-3aH-indene-3a-carboxylic acid ethyl ester (fruitate).

10 Fruity-strawberry ingredients include, but are not limited to, e.g. benzyl cinnamate, ethyl 3-methyl-3-phenyloxirane-2-carboxylate (strawberry pure), ethyl butanoate (ethyl butyrate), ethyl 2-methylpropionate (ethyl isobutyrate), ethyl cyclohexanecarboxylate (esterly), ethyl cinnamate, methyl cinnamate, benzyl cinnamate, ethyl phenyl glycidate, phenyl ethyl butyrate, benzyl butyrate, ethyl isovalerate, phenyl ethyl isovalerate, and 2-octene-4-one.

15 Fruity-raspberry ingredients include, but are not limited to, e.g. 4-(4-hydroxyphenyl)butan-2-one (raspberry ketone), methoxy phenyl butanone, and ethyl 6-acetyloxyhexanoate (berryflor).

Fruity-pineapple ingredients include, but are not limited to, e.g. prop-2-enyl 3-cyclohexylpropanoate (allyl cyclohexyl propionate), prop-2-enyl heptanoate (allyl oenanthate), ethyl octanoate (ethyl oenanthate), 3-methylbutyl octanoate (isoamyl caproate), methyl hexanoate, 20 ethyl hexanoate, pentyl hexanoate (amyl caproate), phenyl ethyl isobutyrate, allyl propionate, and methyl octanoate.

Cassis base is a reconstitution of, i.e. a mixture of fragrance ingredients resembling the smell of, cassis.

The HMR fragrance ingredients are selected from the group consisting of lemon oil, (E)-3,7-dimethylnona-1,6-dien-3-ol (ethyl linalool), benzyl acetate, 3-methyl-2-[(Z)-pent-2-enyl]cyclopent-2-en-1-one (jasmone-cis), 2-(2'-methylpropyl)-4-hydroxy-4-methyltetrahydropyran (Florosa), (E)-1-(2,6,6-trimethylcyclohex-2-en-1-yl)hepta-1,6-dien-3-one (cetone V), N-1-(2,6,6-trimethyl-1-cyclohex-2-enyl)pent-1-en-3-one (Isoraldeine), 3,7-dimethyloct-6-en-1-ol (citronellol), (E)-3,7-dimethylocta-2,6-dien-1-ol (geraniol), geranium oil, 4-(4-hydroxy-4-methylpentyl)cyclohex-3-enecarbaldehyde (Lyrall, Cyclohexal), 5-heptyldihydrofuran-2(3H)-one (peach pure, 30 undecalactone gamma), 1,4-dioxacycloheptadecane-5,17-dione (ethylene brassylate), mixtures

of cyclohexadecanolide and cyclopentadecanone (Silvanone), (5E)-3-methylcyclopentadec-5-en-1-one (Muscenone), (E)-2-methoxy-4-(prop-1-en-1-yl)phenol (isoeugenol), and mixtures thereof.

The HMI fragrance ingredients are selected from the group consisting of citrus-orange ingredients, citrus-mandarin ingredients, 1-(2-tert-butylcyclohexyl)oxybutan-2-ol (amber core),
 5 (3aR,5aS,9aS,9bR)-3a,6,6,9a-tetramethyl-2,4,5,5a,7,8,9,9b-octahydro-1H-benzo[e][1]benzo-furan (ambrox or ambroxan), 5,5,9-tetramethyl-13-oxatricyclo(8.3.0.0.(4.9))tridecane (cetalex or fixambrene), 2,6-dimethyloct-7-en-2-ol (dihydromyrcenol), 3-(1,3-benzodioxol-5-yl)-2-methylpropanal (helional or tropional), (2-tert-butylcyclohexyl) acetate (agrumex), 1-(2,6,6-trimethyl-1-cyclohex-2-enyl)but-3-en-1-one (damascone alpha), 2,4-dimethyl-3-cyclohexene-1-carbaldehyde
 10 (cyclal C or tricyclal or ligustral), 4-allyl-2-methoxyphenol (eugenol), and mixtures thereof.

Citrus-orange ingredients include, but are not limited to, e.g. orange oil, orange terpenes, and orange aldehyde.

Citrus-mandarin ingredients include, but are not limited to, e.g. mandarin oil, tangerine oil, (E)-6,10-dimethylundeca-5,9-dien-2-yl acetate (tangerinol), methyl 2-methylaminobenzoate (dimethyl
 15 anthranilate), and octanol-3.

The RMP fragrance ingredients are selected from the group consisting of 2-(4-methylcyclohex-3-en-1-yl)propan-2-ol (terpineol), hexyl 2-hydroxybenzoate (hexyl salicylate), jasmin oil, 7-hydroxy-3,7-dimethyloctanal (hydroxycitronellal), 3-methyl-5-phenylpentanol (Mefrosol), 2-(phenoxy)ethyl 2-methylpropanoate (phenoxyethyl isobutyrate), (12E)-1-oxacyclohexadec-12-en-2-one
 20 (Habanolide), 4-methoxybenzaldehyde (aubepine para cresol, anisic aldehyde), benzoin resinoids, 3-ethoxy-4-hydroxybenzaldehyde (ethyl vanillin), 4-hydroxy-3-methoxybenzaldehyde (vanillin), 2-ethyl-4-(2',2',3'-trimethylcyclopent-3-enyl)but-enol (Bangalol or Radjanol), mixtures of 2-methyl-1-phenylpropan-2-yl butanoate and (phenoxy)ethyl 2-methylpropanoate (Prunella), and mixtures thereof.

25 The GEN fragrance ingredients are selected from the group consisting of 3,7-dimethylocta-1,6-dien-3-ol (linalool), methyl 3-oxo-2-pentylcyclopentaneacetate (methyl dihydro-jasmonate, cepionate, hedione), hexyl cinnamic aldehyde, 3-(4-(1,1-dimethylethyl)phenyl)-2-methylpropanal (Lilial), (E)-4-(2,6,6-trimethylcyclohex-1-en-1-yl)but-3-en-2-one (ionone beta), 2-phenylethyl alcohol, 1-(2,3,8,8-tetramethyl-1,3,4,5,6,7-hexahydronaphthalen-2-yl)ethanone (sylvamber or iso
 30 e super or iso gamma super), 1,15-pentadecanolide (Thibetolide), (isocamphyl-5)cyclohexanol (sandela), (3R,3aS,6R,7R,8aS)-octahydro-6-methoxy-3,6,8,8-tetramethyl-1H-3a,7-methanoazulene (cedryl methyl ether), and mixtures thereof.

The fragrance composition of the invention may further comprise up to 25% of other fragrance ingredients, which are not specified herein as being members of any of the above groups, excluding odourless or low-odour solvents or diluents, as noted above. They may be single ingredients or mixtures, both synthetic and natural (for example essential oils), and are well described e.g. in: "Common Fragrance and Flavor Materials" by Bauer, Garbe and Surburg, VCH Publ., 2nd edition (1990), and "Perfume and Flavour Materials", Steffen Arctander, published in two volumes by the author (1969), also by Arctander "Perfume and Flavor Materials of Natural Origin" (1960), and "Perfume & Flavor Chemicals", S. Arctander (Allured Publishing, 1994), as well as later editions of this work, which perfume ingredients contained therein are herein incorporated by reference.

Perfume compositions of the present invention may further contain substantially odourless ingredients. In the context of the present invention, "substantially odourless" means that the ingredient has no odour or that its odour is weak and often barely perceptible. These substantially odourless ingredients include excipients conventionally used in conjunction with perfume ingredients in perfume compositions, for example carrier materials, and other auxiliary agents commonly used in the art, e.g. solvents, such as dipropylene glycol (DPG), isopropyl myristate (IPM), benzyl benzoate (BB), propylene glycol (PG) and triethyl citrate (TEC); mineral oils and vegetable oils; and antioxidants. As such, these substantially odourless ingredients are not considered to be perfume ingredients in the context of the present invention. In particular, solvents are not taken into account when calculating the weight percentages.

The perfume compositions of the present invention may be presented in the form of free-oil, or they may be encapsulated. Several encapsulating media are known in the art for encapsulating perfume compositions. Particular encapsulating media include microcapsules formed of aminoplast resins, such as melamine-formaldehyde resins, polyurea, polyamide, as well as copolymers of acrylic acid, methacrylic acid and their esters. Alternatively, the encapsulating media may be formed of natural or modified natural polymers, such as polysaccharides or proteins.

The above definition of the fragrance compositions of the present invention provides sufficient freedom in formulation to permit consideration of the hedonic properties of the composition. The invention can thus enable formulation of fragrance compositions that make people feel invigorated and also have good hedonic properties.

The present invention describes how to formulate reliably fragrance compositions which are likely to induce or be associated with positive, activated moods and emotions. The effects are sufficiently pronounced that they can be measured reliably and reproducibly. The fragrance compositions made according to the teachings disclosed herein can be hedonically pleasant, suitable for a wide range of consumer products, and of sufficient pleasantness/acceptability that they would be appropriate even if they did not possess added functionality. In addition, fragrance compositions of the invention can be resilient to variation in the target consumer group (e.g. British vs. Brazilian), and have been found to be perceived as consistently invigorating, alert, energising, etc. for consumers in the UK, France, and Brazil, for example.

10 Fragrance compositions in accordance with the invention have been found:

- 15 a) to promote positive activated mood states, such as invigorating, exciting, focussed, motivated, empowered, confident, adventurous, alert, daring, and energised: Test subjects have reported that they feel invigorated after smelling or using consumer products incorporating the fragrance compositions, and that the products themselves convey a more invigorating smell;
- b) not to promote negative mood states, such as depressing, stressful, annoying, or bored mood states.

Increasing the level of “invigorating” ingredients, in particular those in group IMPU, increases the likelihood that the fragrance compositions would have a suitable character to enhance the state of invigoration. Other ingredients reduce the likelihood of this benefit being achieved, in particular ingredients that highly contribute to relaxing (RMP) moods.

In an embodiment, the fragrance composition comprises at least about 15%, more preferably at least about 20%, by weight in total of IMPU fragrance ingredients.

25 In an embodiment, the fragrance composition comprises at least four IMPU fragrance ingredients, more preferably at least five IMPU fragrance ingredients. By increasing the number of fragrance ingredients, the hedonics of the fragrance composition are improved.

In an embodiment, the fragrance composition comprises at least one IMPU and/ HMI fragrance ingredient selected from one or more of the following groups:

- 30 - one or more aromatic-eucalyptus ingredients selected from the group consisting of eucalyptus oil, 1-8 cineol (eucalyptol), and mixtures thereof;

- one or more aromatic-mint ingredients selected from the group consisting of peppermint oil, spearmint oil, L- and D/L-2-isopropyl-5-methylcyclohexanol (L- and DL-menthol), [(1R,2S,5R)-5-methyl-2-propan-2-ylcyclohexyl] acetate (menthyl acetate), 2-butan-2-ylcyclohexan-1-one (freskomenthe), 5-methyl-2-prop-1-en-2-ylcyclohexan-1-ol (isopulegol),
5 D/L- and L-2-isopropyl-5-methylcyclohexanone (D/L- and L-menthone), L- and D/L-2-isopropyl-5-methylcyclohexanone (L- and racemic isomenthone), and mixtures thereof;
 - one or more aromatic-rosemary ingredients selected from the group consisting of rosemary oil, (1R,2S,4R)-1,7,7-trimethylbicyclo[2.2.1]heptan-2-ol (borneol), (1R,4S,6R)-1,7,7-trimethylbicyclo[2.2.1]heptan-6-ol (iso-borneol), 1,7,7-trimethylbicyclo[2.2.1]heptan-2-one
10 (camphor), 8,8-dimethyl-9-propan-2-yl-6,10-dioxaspiro[4.5]decane (opalal), 2-(5-methyl-5-vinyltetrahydro-2-furanyl)-2-propanol (linalool oxide), trans-methyl 1,4-dimethylcyclohexanecarboxylate (cyprisate), 2-ethenyl-2,6,6-trimethyloxane (limetol), 2-butyl-4,4,6-trimethyl-1,3-dioxane (herboxane), and mixtures thereof;
 - one or more citrus-lime ingredients selected from the group consisting of lime oil, lime
15 terpenes, lime oxide, 1-methyl-4-(prop-1-en-2-yl)cyclohex-1-ene (dipentene), 1-methyl-4-propan-2-ylidenecyclohexene (terpinolene), (E)-3,7-dimethylocta-1,3,6-triene (ocimene), 1,1-diethoxy-3,7-dimethylocta-2,6-diene (citrathal), elemi oil, (4-methyl-1-isopropyl)benzene (para-cymene), 3,7,7-trimethylbicyclo[4.1.0]hept-3-ene (delta-3-carene), and mixtures thereof;
 - one or more spicy-pepper ingredients selected from the group consisting of ginger oil, nutmeg oil, olibanum oil, cardamom oil, copaiba balsam oil, curcuma oil, pepper oil, (4Z)-4,11,
20 11-trimethyl-8-methylenebicyclo[7.2.0]undec-4-ene (caryophyllene), and mixtures thereof;
 - one or more citrus-floral/lemon ingredients selected from the group consisting of bergamot oil, coriander oil, coriander seed oil, and mixtures thereof;
 - one or more citrus-orange ingredients selected from the group consisting of orange oil, orange terpenes, orange aldehyde, and mixtures thereof; and/or
25
 - one or more citrus-mandarin ingredients selected from the group consisting of mandarin oil, tangerine oil, (E)-6,10-dimethylundeca-5,9-dien-2-yl acetate (tangerinol), methyl 2-methylaminobenzoate (dimethyl anthranilate), octanol-3, and mixtures thereof.
- 30 The above groups of invigorating fragrance ingredients may be combined as desired.

In an embodiment, the amounts of the ingredients are selected such that IMPUs + HMIs + GENs $\geq 70\%$, more preferably IMPUs + HMIs + GENs $\geq 75\%$, and most preferably IMPUs + HMIs + GENs $\geq 80\%$.

In an embodiment, the amounts of the ingredients are selected such that $(\text{IMPUs} + \text{HMIs}) / (\text{IMPUs} + \text{HMIs} + \text{RMPs} + \text{HMRs}) \geq 0.72$, more preferably $(\text{IMPUs} + \text{HMIs}) / (\text{IMPUs} + \text{HMIs} + \text{RMPs} + \text{HMRs}) \geq 0.75$, and most preferably $(\text{IMPUs} + \text{HMIs}) / (\text{IMPUs} + \text{HMIs} + \text{RMPs} + \text{HMRs}) \geq 0.8$.

5 In an embodiment, the amounts of the ingredients are selected such that $\text{IMPUs} / (\text{IMPUs} + \text{HMPs} + \text{RMPs}) \geq 0.52$, more preferably $\text{IMPUs} / (\text{IMPUs} + \text{HMPs} + \text{RMPs}) \geq 0.55$, and most preferably $\text{IMPUs} / (\text{IMPUs} + \text{HMPs} + \text{RMPs}) \geq 0.6$.

Another aspect of the invention relates to a method of delivering positive activated mood benefits, particularly invigoration, to human subjects, comprising delivering the fragrance composition to said human subjects. For instance, the fragrance may be delivered in a consumer product.

10 Therefore, the present invention also provides a consumer product comprising the fragrance composition of the invention.

The perfume compositions of the present invention may be used to impart desirable odour impressions on all manner of consumer products, such as for instance hydro-alcoholic perfumes, deodorants, antiperspirants, skin care products, hair care products, laundry care products, home
15 care products or air fresheners.

More particularly, the perfume compositions of the present invention may be employed in laundry care applications, personal care products for treating the hair and/or skin of human subjects, oral care products, and air care products.

20 Consumer products comprise formulated mixtures of various functional ingredients, such as surfactants, emulsifiers, polymers, fillers and solvents. These formulated mixtures are usually referred to as "bases".

Particular consumer products include, but are not limited to consumer products intended for application to the body (i.e. skin or hair), to hard surfaces (e.g. kitchen and bathroom worktops, ceramic surfaces), to fabrics, and for air care benefits (e.g. air-fresheners). Such products can
25 take a variety of forms, including, but not limited, to powders, bars, sticks, tablets, creams, mousses, gels, liquids, sprays and sheets. The proportion of perfume composition contained in such products may lie in a range from 0.05% (as for example in a low odour skin cream) to 100 wt.-% (as for example in an air freshener) based on the total weight of the consumer product. The means of incorporating a perfume composition into a consumer product is known. Existing

techniques may be used for incorporating the perfume composition directly into a product, or the perfume composition may be absorbed on a carrier material and then admixed to the product.

In an embodiment of the present invention, the consumer product is a laundry care product. Laundry care products include powder and liquid detergents and fabric softeners, stain removers and pre-wash treatments, conditioners and softeners (including standard and concentrated conditioners, softeners and dryer sheets), laundry aids (including stain removers, ironing aids, whiteners and colour care products and other ancillary fabric care products), laundry detergents (including machine wash liquid detergents, other machine wash detergents - including powders, capsules and tablets - and hand wash detergents - powders, flakes and cakes/bars), sheet sprays, clothing sprays, laundry perfumes, dryer sachets, perfumed sachets, dryer sheets, laundry soap, laundry detergents, detergent for delicate textiles, ironing sprays, starch, perfume sheets, pillow mists, drawer liner sheets, cedar closet sprays, linen waters, and refills and combinations thereof.

In an embodiment of the invention, the consumer product is a personal care product. Personal care products include soaps, shower gels, body creams, body lotions, body mists, perfumery, cosmetics, floating bath oils, after shaves, creams, lotions, deodorants (including stick deodorants), pre-electric shave lotions, after-shave lotions, antiperspirants, shampoos, conditioners, rinses, skin care products, eye makeups, body shampoos, protective skin formulations, lipsticks, lip glosses, after-bath splashes, pre-sun and sun products (including sunscreens). Virtually any chemical product which comes into contact with the hair or skin and which may include effective amounts, concentrations or proportions of one or more of the perfume compositions of the present invention may be considered a personal care product according to the present invention.

In an embodiment of the present invention, the consumer product is an air care product. Air care products include candles and air-freshener devices, such as liquid electrical air-freshener devices, aerosol sprays, pump action sprays, perfumed candles, membrane permeation devices, liquid wick devices, oil based gel perfumes, and aqueous gels.

In an embodiment of the present invention, the consumer product is a home care product. Home care products can be used particularly for cleaning, rinsing, care or treatment of industrial, domestic or communal hard surfaces, as well as textile article surfaces; they are targeted at conferring on the surfaces treated therewith benefits such as water repellence, soil release, stain resistance, anti-fogging, surface repair, anti-wrinkling, shine, lubrication and/or at improving the residuality, impact and/or efficacy of active materials comprised in said home care product. Hence,

home care compositions according to the invention include surface cleaning compositions (for example glass, floor, counter, bath, toilet bowl, sink, appliance and furniture cleaning compositions), disinfectants (for example spray and solid air disinfectants, including gels, and spray, solid, liquid and paste surface disinfectants), waxes and other surface protecting and/or polishing compositions, and rug shampoos.

Also included within the scope of the invention is a method of delivering positive activated mood benefits or invigoration benefits to a subject, particularly a human, comprising administering to the subject an effective amount of a fragrance composition in accordance with the invention. The composition should be administered in an appropriate amount to produce a benefit (i.e. a suprathreshold amount) without causing irritation (i.e. a non-irritant amount). An appropriate effective amount of any given composition can be readily determined, e.g. by experiment. To be effective, the compositions should be administered for inhalation by the subject.

Therefore, the present invention also provides a method of improving the invigoration state of a human subject, comprising the step of providing an effective amount of the fragrance composition of the invention to the human subject.

In the context of the studies resulting in the present invention, several fragrance ingredients have been identified that are able to improve the invigoration state of a human subject.

Therefore, the present invention also relates to the use of a fragrance ingredient for improving the invigoration state of a human subject, wherein the fragrance ingredient is selected from the group consisting of:

- one or more aromatic-eucalyptus ingredients selected from the group consisting of eucalyptus oil, 1-8 cineol (eucalyptol), and mixtures thereof;
- one or more aromatic-mint ingredients selected from the group consisting of peppermint oil, L- and D/L-2-isopropyl-5-methylcyclohexanol (L- and DL-menthol), [(1R,2S,5R)-5-methyl-2-propan-2-ylcyclohexyl] acetate (menthyl acetate), 2-butan-2-ylcyclohexan-1-one (freskomenthe), 5-methyl-2-prop-1-en-2-ylcyclohexan-1-ol (isopulegol), D/L- and L-2-isopropyl-5-methylcyclohexanone (D/L- and L-menthone), L- and D/L-2-isopropyl-5-methylcyclohexanone (L- and racemic isomenthone), and mixtures thereof;
- one or more aromatic-rosemary ingredients selected from the group consisting of 1R,2S,4R)-1,7,7-trimethylbicyclo[2.2.1]heptan-2-ol (borneol), (1R,4S,6R)-1,7,7-trimethylbicyclo[2.2.1]heptan-6-ol (iso-borneol), 1,7,7-trimethylbicyclo[2.2.1]heptan-2-one (camphor), 8,8-dimethyl-9-propan-2-yl-6,10-dioxaspiro[4.5]decane (opalal), 2-(5-methyl-5-vinyltetra-

hydro-2-furanyl)-2-propanol (linalool oxide), trans-methyl 1,4-dimethyl-cyclohexane-carboxylate (cyprisate), 2-ethenyl-2,6,6-trimethyloxane (limetol), 2-butyl-4,4,6-trimethyl-1,3-dioxane (herboxane), and mixtures thereof;

- 5 - one or more citrus-lime ingredients selected from the group consisting of lime oil, lime terpenes, lime oxide, 1-methyl-4-(prop-1-en-2-yl)cyclohex-1-ene (dipentene), 1-methyl-4-propan-2-ylidenecyclohexene (terpinolene), (E)-3,7-dimethylocta-1,3,6-triene (ocimene), 1,1-diethoxy-3,7-dimethylocta-2,6-diene (citral), elemi oil, (4-methyl-1-isopropyl)benzene (para-cymene), 3,7,7-trimethylbicyclo[4.1.0]hept-3-ene (delta-3-carene), and mixtures thereof;
- 10 - one or more spicy-pepper ingredients selected from the group consisting of cardamom oil, copaiba balsam oil, curcuma oil, pepper oil, (4Z)-4,11,11-trimethyl-8-methylenebicyclo[7.2.0]undec-4-ene (caryophyllene), and mixtures thereof;
- one or more citrus-orange ingredients selected from the group consisting of orange aldehyde, and mixtures thereof; and/or
- 15 - one or more citrus-mandarin ingredients selected from the group consisting of tangerine oil, (E)-6,10-dimethylundeca-5,9-dien-2-yl acetate (tangerinol), methyl 2-methylaminobenzoate (dimethyl anthranilate), octanol-3, and mixtures thereof.

The present invention is further illustrated by means of the following non-limiting examples:

Example 1: Functional Near Infrared Spectroscopy Testing

20 *Task*

The experimental protocol was divided in two parts:

25 In the first part, participants smelled a series of fifteen (three consecutive repetitions of five different odour conditions) fragrance samples provided on sorbarods, while their brain activity was being monitored through a fNIRS cap placed on the forehead. fNIRS channels were arranged as shown in Figure 1.

In the second part, they rated each fragrance for the dimensions of pleasantness, invigorating power, relaxing power, happy power, and strength of the odour using a questionnaire. During this second part, their brain activity was not monitored.

30 The samples were typically prepared as follows: In each sorbarod, 0.8 g of neat fragrance oil was placed in the polyester insert by means of a pipette. Previous tests demonstrated that a range

between 0.75 g and 0.85 g of neat oil will not significantly alter the perception of the fragrance in terms of properties and intensity, therefore the range is acceptable for any brain imaging test without influencing the results. Once the oil was dropped, the plastic cap was immediately placed on the sorbarod to prevent any diffusion of the fragrance in the environment. Sorbarods were then
5 kept in standing (vertical) position for at least 24 h before being used for the test. After the sorbarod rests for 24 h, the full insert becomes soaked with the oil, guaranteeing that, if adequately stored (i.e. without exposing the sorbarod to direct sunlight or to extremely high temperatures, above 35 °C), the fragrance oil maintains the same olfactive properties (characteristics and intensity) for at least four weeks, up to eight weeks, depending on the oil. In this time frame, the sorbarods can
10 be used for brain imaging tests without any significant alteration of the results. In the tests described in the current document, the samples were used within two weeks from the day they were created. Samples were normally stored in a refrigerator at 4 °C from the moment they were made to the morning of the test. The experimenter made sure that sorbarods were taken out of the fridge at least 2 h before the test to ensure they reached room temperature before being used.
15 Removing them from the fridge the evening before the test, and leaving them overnight at room temperature, also does not have any significant effect on test results, as previous trials demonstrated.

In the first part, participants were asked to smell, keeping their eyes closed, the proposed number of sorbarods. They were not required to complete any other tasks, in order to eliminate any
20 possible source of confound in the data not related to the perception of odours. In each test, one of the samples contained the fragranced benchmark and another one did not contain any fragrance (control sample). The other two or three samples contained the test fragrances. Thanks to the three repetitions, it was possible to confirm that the overall results were not affected by the number of fragrances tested in one trial, i.e. that the test of four or five different conditions in a
25 single test was completely equivalent and that the studies were fully comparable.

The order of presentation for the sorbarods was semi-randomized: the order of the fragrances in each block was fully randomized, however participants had to complete smelling all samples in a block before moving to the following one, and the first sample of each block was always different from the last of the previous one, so to avoid smelling the same fragrance twice in two consecutive
30 assessments.

After the participants had smelled all the sorbarods, the fNIRS cap was removed from the head and they completed the questionnaires at a self-timed pace, meaning that they were able to smell again each sample as many times as they wanted and take all the time they needed to answer

each question. For this reason, no specific timeline for the second part of the experimental procedure will be reported in the following section.

Timeline

5 All participants completed three blocks of five samples each. The three blocks were consecutive, and the participants were unaware that the sequence of four or five samples was repeated three times, as they were only told that the test involved smelling fifteen samples. Participants were asked, for each sample, to take the sorbarod in their hand, close their eyes, smell the sorbarod for thirty seconds and then, after returning the sorbarod to the experimenter, rest for thirty seconds with the eyes open. Longer intervals between two consecutive samples were taken if the
10 participant explicitly asked for it, or if the fNIRS signals were not at a baseline level (necessary condition to start with a new trial). The latter case would happen in case of heavy movements from the participants, such as sneezing; however, the recovery time was in the order of a few seconds.

Participants

For each study, at least fifteen healthy adults took part in this experiment. No specific selection
15 criteria (i.e. handedness, age, etc.) have been applied in the choice of the participants, since no relevant exclusion criteria have been identified prior to testing.

Statistical Analysis

Statistical significance was verified using a 2-tailed Student's t-test with a statistical significance threshold at 0.05.

20 Example 2: Mood Portraits® Testing

Task

Mood Portraits® is a self-report nonverbal method using pictures to measure consumers' moods and emotional responses to fragrances and flavours. This method allows participants to express what they feel in response to smelling a fragrance by selecting images that match their feelings
25 rather than verbalising and rating their thoughts and emotions.

The experimental protocol was divided in two parts. In the first one, participants smelled a series of eight sorbarods and, while smelling each one, they selected a number of pictures chosen from a set of thirty pictures to describe the fragrance. The thirty pictures, printed in colour on A4

laminated sheets, were arranged on a display board. The number of pictures chosen by each participant to describe the fragrances was not pre-determined: each participant could choose as many as they wanted to describe each fragrance. The minimum number of pictures they had to select was one. In the second part of the test, they rated each fragrance for the dimensions of
5 pleasantness, invigorating power, relaxing power, happy power, familiarity and strength of the odour using a questionnaire.

The order of presentation for the sorbarods was fully randomised and the pictures were arranged on four different boards to create a randomisation of the layout. For each series of eight fragrances, 80 healthy adults were asked to participate.

10 *Timeline*

All participants smelled and rated eight fragrances during a single session. There was no time limit for the participants to smell the fragrance nor to select the pictures associated to each fragrance. This allowed the participants to provide truer responses without any time pressure associated.

Participants were allowed breaks at their leisure to prevent any fatigue or carry over effect, and
15 moved to the following fragrance only when they considered themselves ready.

Participants

For each test involving eight fragrances, eighty healthy adults were asked to participate in the study. Participants were screened for olfactive impairment, respiratory conditions or other personal conditions that could alter their sense of smell (e.g. pregnancy or consumption of
20 tobacco-based products, like cigarettes). No other selection criteria (i.e. handedness, age, gender, etc.) have been applied in the choice of the participants, since no relevant exclusion criteria have been identified prior to testing.

Example 3: Compositions Tested

Compositions A through M were subjected to fNIRS and/or Mood Portraits® testing. Among these,
25 Compositions H through M are comparative examples; while Compositions A through G are fragrance compositions according to the present invention.

Ingredients contained in these compositions are specified in the two tables below.

Ingredient	Group	A wt%	B wt%	C wt%	D wt%	E wt%	F wt%	G wt%
CEDRYL METHYL ETHER	GEN		0.2000		0.8850	20.0000		
CEPIONATE	GEN	8.0000						
HEDIONE	GEN	14.0000	5.0000		2.6549	16.0000	10.7527	11.3636
HEXYL CINNAMIC ALDEHYDE	GEN				6.1947			
IONONE BETA	GEN		0.6000				1.0753	0.1818
ISO E SUPER	GEN	3.6000	8.0000	4.0000	4.4248		15.5914	1.8182
LILIAL	GEN	1.4000	0.2000					
LINALOOL	GEN	6.0000	2.8000	14.0000	7.0796		8.6022	5.5455
PHENYL ETHYL ALCOHOL	GEN						1.0753	0.0636
SANDELA	GEN	0.2000						
AGRUMEX	HMI					0.4000	2.1505	3.6364
AMBROFIX	HMI		0.2000		0.1416	1.2000		
CETALOX	HMI	2.2000						
DAMASCONE ALPHA	HMI	0.0500	0.0200		0.0708		0.0538	
DIHYDRO MYRCENOL	HMI	9.0000	1.5000	5.0000	5.9292	16.6860	2.1505	
EUGENOL	HMI				0.1327			
MANDARIN OIL	HMI	4.0000	1.5000		2.1726		4.3011	
MANDARINAL BASE	HMI						0.4301	
ORANGE OIL	HMI			1.5000			8.6022	9.0909
ORANGE TERPENES	HMI				3.9823			14.6882
TAMARINE BASE	HMI						1.0753	
TRICYCLAL	HMI	0.0600	0.1000	0.1000	0.3540	0.4000	0.2151	1.0909
TROPIONAL	HMI	1.0000	0.7000		0.7080			
ALLYL CAPROATE	HMP							0.0909
ALLYL CYCLOHEXYL PROPIONATE	HMP					0.1000		
ALLYL OENANTHATE	HMP							0.0273
CALONE FINE	HMP	0.3000			0.0708	0.0200		
CRISTALON	HMP					0.4000		
DAMASCENONE	HMP	0.0200	0.0150		0.0442			0.1091
DAMASCONE DELTA	HMP							0.0364
DECALACTONE GAMMA	HMP							2.7273
ETHYL BUTYRATE	HMP							0.0364
ETHYL HEXANOATE	HMP							0.0455

Ingredient	Group	A	B	C	D	E	F	G
ETHYL MALTOL	HMP	wt%	wt%	wt%	wt%	wt%	wt%	wt%
GRAPEFRUIT OIL	HMP	4.0000	0.3000				0.3226	0.3091
HEXENYL-3-CIS SALICYLATE	HMP							
HEXYL ACETATE	HMP				1.7699	8.0000		
METHYL CEDRYL KETONE	HMP	0.6000						3.1818
METHYL PAMPLEMOUSSE	HMP						1.6129	0.1818
POMEROSE	HMP							0.0182
STYRALLYL ACETATE	HMP		0.1000		0.8850	0.1000		1.6364
TAGETE OIL	HMP							0.0091
VERTOFIX COEUR	HMP				0.8850			
BENZYL ACETATE	HMR							0.2000
CITRONELLOL	HMR	0.2000			0.4425			3.6364
CYCLOHEXAL	HMR		0.1000					
ETHYL LINALOOL	HMR	5.0000	2.0000					
ETHYLENE BRASSYLATE	HMR	4.0000		3.0000	3.5398			
FLOROSA	HMR	0.1000				4.0000		
GERANIOL	HMR		0.3000	0.2500	0.4425		1.0753	
GERANIUM OIL	HMR	0.2000			0.4425			
ISORALDEINE 70	HMR	0.3000			0.8850			
ISORADEINE 95	HMR						2.1505	
JASMONE CIS	HMR							0.0091
LEMON OIL	HMR	1.0000	0.8000				2.1505	
LEMON TERPENES	HMR			5.0000				
PEACH PURE	HMR							2.7273
ALLYL AMYL GLYCOLATE	IMPU		0.0500			2.8000		
BENZYL SALICYLATE	IMPU	0.5000	8.0000	15.0000				12.7273
BERGAMOT OIL	IMPU	11.0000	6.0000	1.0000	6.1575		5.3763	4.5455
BORNEOL CRYSTALS	IMPU					0.8000		
CAMPHOR	IMPU			0.4000				
CARDAMOM SEED OIL	IMPU	0.0200	0.1500		0.442		0.5376	
CAROPHYLLENE	IMPU			0.2500				
CITRAL	IMPU				0.2655		0.9677	0.2727
CYCLAMEN ALDEHYDE	IMPU							0.9091

Ingredient	Group	A wt%	B wt%	C wt%	D wt%	E wt%	F wt%	G wt%
CYCLOGALBANATE	IMPU	0.1000	0.0200		0.7080		0.5376	
DIMETOL	IMPU							2.7273
EUCALYPTUS GLOBULUS OIL	IMPU	0.2000		4.0000				
EVERNYL	IMPU	0.1000						
FLORALOZONE	IMPU				0.1770		0.1075	
FRESKOMENTHE	IMPU				0.5310	1.6000		0.9091
GINGER OIL	IMPU			1.0000		0.8000		
ISOMENTHONE	IMPU						1.0753	
LAVANDIN OIL	IMPU	0.2000	0.2000	0.4000		4.0000		0.0091
LAVANDIN BASE	IMPU			5.1000				
LIME OIL	IMPU	0.3000						0.0027
LIME OXIDE	IMPU		0.0500					
LINALYL ACETATE	IMPU	2.5000		20.0000	2.6549	4.0000	12.9032	1.8182
LITSEA CUBEBA OIL	IMPU						0.5376	
MENTHOL RACEMIC	IMPU							1.3636
NUTMEG OIL	IMPU		1.5000					
OLIBANUM BASE	IMPU		0.0500					
PATCHOULI OIL	IMPU		0.1000					
PEPPERMINT OIL	IMPU			0.1000	0.0354			
PEPPER OIL	IMPU	0.2000	0.1000					
ROSE OXIDE	IMPU				0.0442			0.0091
BUTYL HYDROXY TOLUENE	INERT	0.4000	0.2000					
DIETHYL PHTHALATE	INERT	0.1800	0.2700					
DIPROPYLENE GLYCOL	INERT	11.4450	49.2250		38.8850		1.0323	0.2700
DOWANOL TPM	INERT						0.1076	
TRIETHYL CITRATE	INERT			19.0600				
ETHYL VANILLIN	RMP						0.2151	0.0091
HABANOLIDE	RMP	1.8000			3.0973			0.9091
PHENOXY ETHYL ISOBUTYRATE	RMP							0.3636
RADJANOL	RMP	0.0200	0.8000		0.4425			
VANILLIN	RMP	0.1000	0.1000					0.0273
ADOXAL		0.0300						
ALDEHYDE C10 DECYLIC		0.0080			0.0442	0.1000		0.0364

Ingredient	Group	A	B	C	D	E	F	G
ALDEHYDE C110 UNDECYLIC		wt%	wt%	wt%	wt%	wt%	wt%	wt%
ALDEHYDE C11 UNDECYLENIC						0.0400		0.0091
ALDEHYDE C12 LAURIC		0.0060				0.1400		0.0273
ALDEHYDE C12 MNA		0.0080			0.0442	0.0800		
ALDEHYDE C8 OCTYLIC								0.0455
ALDEHYDE C9 NONYLIC		0.0040						0.0091
AMBERKETAL			0.1000					
AMBERMAX							0.1076	
AMBRE BASE		0.2000						
AMBRETTOLIDE			0.3000					
AMPHERMATE			0.0500					
AMYL SALICYLATE		0.3000					1.0753	
ANETHOLE							0.1075	
BASIL OIL				0.0300	0.0885		0.3226	
BENZALDEHYDE		0.0020						
BOISAMBRE FORTE		0.0200			1.3274			
BORNYL ACETATE				0.2500				
BUTYL ACETATE			0.0100					0.0526
BUTYL QUINOLINE SECONDARY		0.0020				0.0400		
CALONE		0.5000			0.0442			
CARVONE LAEVO					0.0885			
CASMERAN		0.1000	0.4000			0.8000		
CEDARWOOD OIL		0.2000	1.2000			0.2000		
CINNAMON BARK OIL			0.0100					
CINNAMYL ACETATE								0.0273
CISTUS OIL		0.0040						
CITRONELLYL NITRILE						0.8000		
CLONAL						0.1000		
CLOVE LEAF OIL					0.0885			
COSMONE			0.2000					
COUMARINE			0.4000		0.0885	0.4000	1.2903	0.0910
DIPHENYL OXIDE							1.3023	
ETHYL ACETATE							1.5054	

Ingredient	Group	A	B	C	D	E	F	G
ETHYL METHYL-2-BUTYRATE		wt%	wt%	wt%	wt%	wt%	wt%	wt%
FENNALDEHYDE		0.1000	0.0020					
FLORHYDRAL					0.2655			
FIXOLIDE			1.0000					
FRESCILE		0.0020						
FRUCTONE								3.1818
GALAXOLIDE		3.0000	1.8000				5.3763	4.5455
GALBANONE						0.0240		
GALBANUM OIL				0.0300				
GALBEX			0.1000					
GERANYL ACETATE		0.1000		0.5000				0.1091
HAWTHORN SWEET BASE							1.0753	
HELIOTROPINE		0.0060				4.0000		
HELVETOLIDE						2.0000		
HEPTALACTONE GAMMA								0.0009
HEXENOL-3-CIS		0.0600	0.0300		0.0885		0.3763	0.0727
HEXENYL-3-CIS ACETATE		0.0800			0.1770	0.2000		0.2727
IRALIA			0.0500					
IRISONE ALPHA						0.4000		0.0727
IRONE ALPHA			0.0500					
ISOAMYL ACETATE							0.0538	
ISOPROPYL-2-METHYL-4 THIAZOLE								0.0018
ISOPROPYL METHYL-2-BUTYRATE			0.0100					
ISORALDEINE CETONE ALPHA			1.0000					
JAVANOL		0.0100	0.1000				0.1075	
KARANAL					0.1770			
KARMAFLOR								0.2727
KEPHALIS			0.9000					
LAVENDER OIL				0.0300				
LEMONGRASS OIL		0.1000						
LIFFAROME		0.0200	0.0900		0.0442	0.2000	0.1613	
MANZANATE			0.0020			0.0200	0.0215	0.2000
MARENIL		0.0020			0.0708			

Ingredient	Group	A	B	C	D	E	F	G
MELONAL		wt%	wt%	wt%	wt%	wt%	wt%	wt%
METHYL ANTHRANILATE			0.0010		0.0354		0.0108	
METHYL DECALACTONE								0.0182
METHYL OCTYNE CARBONATE							0.0108	
MYRCENE 90					0.0770			
NEOCASPIRENE					0.0265			
NEROLI OIL		0.0200				1.2000		0.4545
NYMPHEAL								
OAKMOSS BASE		0.0998						
ORANGER CRYSTALS					0.0442			
ORRIS BASE			0.0400					
OSYROL		0.0300						
OXYOCATLINE FORMATE						2.0000		
PARAWOOD BASE		0.0003						
PETALIA						0.4000		
PHENYL ETHYL ACETATE						0.0200		
PRECYCLEMONE B						0.1000		
PRENYL ACETATE								0.9090
PRUNELLA BASE								0.3727
PYRALONE		0.0060						
ROSYFOLIA						0.2000		0.9091
ROSYRANE						0.0100		
SANDALWOOD OIL		0.0200	0.2000					
SCENTENAL			0.1000					
SERENOLIDE						4.0000		
SPIKE LAVENDER OIL		0.2000						
STEMONE			0.0050					
SYLKOLIDE								0.2632
TANAISONNE						0.8000		
TETRAHYDRO LINALOOL								0.9091
THYME OIL		0.0200	0.0200					
TIMBEROL							0.5376	
TONKA BEANS EXTRACT		0.0200						

Ingredient	Group	H	I	J	K	L	M
HEDIONE	GEN		11.200	0.5333	6.7000	8.0000	24.3739
HEXYL CINNAMIC ALDEHYDE	GEN	11.8182					3.0435
IONONE BETA	GEN	0.0545				3.0000	1.3043
ISO E SUPER	GEN				14.3200		15.6522
LILIAL	GEN				4.8000		
LINALOOL	GEN	10.0000		2.0000		3.0000	6.0870
PHENYL ETHYL ALCOHOL	GEN			2.6667	0.5200	3.0000	
SANDELA	GEN		0.3000				0.0870
SYLVAMBER	GEN			4.000			
THIBETOLIDE	GEN		1.8000				
AGRUMEX	HMI	1.8182					1.7391
AMBROFIX	HMI		0.0150	0.0533			0.0174
DIHYDRO MYRCENOL	HMI					5.0000	
EUGENOL	HMI				0.1000		0.1000
ORANGE OIL	HMI					2.0000	
ORANGE TERPENES	HMI	5.4545					2.4348
TRICYCLAL	HMI	0.1818					0.6087
ALLYL CYCLOHEXYL PROPIONATE	HMP						0.0870
ALLYL OENANTHATE	HMP	0.9091					0.3478
CALONE FINE	HMP						0.0174
CASSIS BASE	HMP						0.3478
DAMASCENONE	HMP	0.0455	0.0800				0.0174
DAMASCONE BETA	HMP				0.0300		
DAMASCONE DELTA	HMP			0.0670	0.0300		0.1739
DECALACTONE GAMMA	HMP						0.2609
DIMETHYL BENZYL CARBINYL BUTYRATE	HMP						0.2609
ETHYL BUTYRATE	HMP	0.0909					0.0174
ETHYL ISOBUTYRATE	HMP	0.0455					
ETHYL MALTOL	HMP	0.3636		0.0200		0.8000	1.7391
GRAPEFRUIT OIL	HMP	0.2727					
HEXENYL 3 CIS SALICYLATE	HMP		1.5000	2.6667			
HEXYL ACETATE	HMP	0.9091					0.6087
METHYL PAMPLEMOUSSE	HMP						0.0870

Ingredient	Group	H	I	J	K	L	M
POMAROSE	HMP		wt%	wt%	wt%	wt%	wt%
STRAWBERRY PURE	HMP					0.0500	
STYRALLYL ACETATE	HMP	2.7273		0.0333	0.5000		0.0870
VELOUTONE	HMP		0.3000				0.1739
YLANG YLANG OIL	HMP			0.4000			
BENZYL ACETATE	HMR		0.8000	1.1333	0.5000	3.0000	0.3478
CITRONELLOL	HMR			2.0000	0.5300	3.0000	1.3043
CYCLOHEXAL	HMR			2.6667	4.8000		
ETHYL LINALOOL	HMR		3.0000		0.0200	4.0000	
ETHYLENE BRASSYLATE	HMR		6.9000			5.0000	
FLOROSA	HMR		6.0000				3.0435
GERANIOL	HMR				0.0600		
GERANIUM OIL	HMR				0.0100		
ISOEUGENOL	HMR			0.0667			
ISORALDEINE 70	HMR			3.0667		3.0000	1.3043
ISORALDEINE 95	HMR				19.5200		
JASMONE CIS	HMR					0.0500	0.0435
LEMON OIL	HMR						0.2609
PEACH PURE	HMR	2.7273	0.0400	0.5333	0.3000		0.3478
SILVANONE	HMR		3.2000				
ALLYL AMYL GLYCOLATE	IMPU						0.3478
BENZYL SALICYLATE	IMPU	0.4545			1.6000	2.5000	0.8696
BERGAMOT OIL	IMPU			2.0000	1.0000		
CAMPHOR	IMPU					1.0000	
CYCLAMEN ALDEHYDE	IMPU	1.8182	1.2000			2.0000	1.7391
CYCLOGALBANATE	IMPU			0.0667	0.1000		0.0870
EUCALYPTUS GLOBULUS OIL	IMPU					1.0000	
EVERNYL	IMPU						0.4348
FLORALOZONE	IMPU	0.9091					0.1739
LAVANDIN OIL	IMPU					0.1500	
LIME TERPENES BASE	IMPU	0.4545					
LINALYL ACETATE	IMPU					3.0000	1.7391
PATCHOULI OIL	IMPU			0.1333			

Ingredient	Group	H	I	J	K	L	M
BENZYL BENZOATE	INERT				1.0000		
BUTYL HYDROXY TOLUENE	INERT	0.9091					
DIPROPYLENE GLYCOL	INERT	44.0818	32.7060	47.3233	0.5400	10.9500	9.5918
ISOPROPYL MYRISTATE	INERT		0.4950		8.7000		
TINO GUARD	INERT						0.1739
TOCOPHEROL ALPHA	INERT						0.0870
TRIETHYL CITRATE	INERT		0.9000				0.8609
AUBEPINE PARA CRESOL	RMP		0.9000			3.0000	0.0087
ETHYL VANILLIN	RMP	0.0909	0.2000	8.0000	0.5000	1.5000	0.0870
HABONLIDE	RMP		2.5000				
HEXYL SALICYLATE	RMP		5.4000	8.6000			1.7391
JASMIN OIL	RMP				0.3000		
MEFROSOL	RMP		5.8000				
RADJANOL	RMP		0.4000				0.1739
TERPINEOL	RMP	0.3636	3.6000			3.0000	1.7391
VANILLIN	RMP				1.0000		
ACETAL CD							0.3478
ACETOIN						0.0300	
ALDEHYDE C10 DECYLIC		0.2273				0.5000	0.0348
ALDEHYDE C11 UNDECYLENIC						0.2000	
ALDEHYDE C110 UNDECYLENIC			0.0800				
ALDEHYDE C12 LAURIC		0.1182	0.0800			0.2500	0.0348
ALDEHYDE C12 MNA			0.0833				
ALDEHYDE C8 OCTYLIC		0.0909				0.1000	
ALDEHYDE C9 NONYLIC			0.0500				
ALDEHYDE ISO C11			0.0020			0.1000	
AMBER XTREME							0.0226
AMBERKETAL							0.1304
AMBRETTOLIDE							0.1304
AMBROCENIDE							0.0030
AMYL BUTYRATE		0.0909					
BENZALDEHYDE		0.9091				0.5000	
BICYCLO NONALACTONE			0.5000				

Ingredient	Group	H	I	J	K	L	M
BOURGEONAL		0.1818	0.8000				
BUTYL BUTYRO LACTATE		0.9091					
BUTYL CYCLOHEXYL ACETATE PARA						3.0000	
CARVONE LAEVO		0.0091					
CASMERAN							0.0870
CEDARWOOD OIL						0.1000	
CINNAMIC ALCOHOL					0.8000		
CITRONELLYL ACETATE		0.0909	1.8000				0.8696
COCONUT BASE				2.6667			
COUMARINE						2.0000	
CUMINIC ALDEHYDE		0.0455					
CYCLOHEXYL SALICYLATE			1.2000				
DECALACTONE DELTA						0.2000	
DIHYDRO EUGENOL				0.1000			0.0870
DIMETHYL BENZYL CARBINYL ACETATE		0.5455			0.5000	1.0000	0.1739
DIMETHYL PHENYL ETHYL CARBINOL							0.3478
DIPHENYL OXIDE		0.0455				1.5000	
DUPICAL			0.1000				
EBANOL			0.2000			1.0000	
ETHYL METHYL-2-BUTYRATE		0.2727				0.5000	0.4348
ETHYL OCTANOATE		0.0636					
FENNELALDEHYDE			0.2000				
FIXOLIDE					6.7000		
FLORHYDRAL		0.4545				0.5200	
FLOROCYCLENE							0.4348
GALAXOLIDE				8.0000	17.0100		7.8261
GERANYL ACETATE						1.0000	
GUAVE BASE		2.7273					
HELIOTROPINE			0.8000	0.6667	1.9000	1.2000	0.0087
HEXENOL-3-CIS		0.1818				0.4000	0.1043
HEXENYL-3-CIS ACETATE			0.0400	0.0533		0.7000	0.2609
HEXENYL-3-CIS ISOBUTYRATE							0.0435
HEXYL ISOBUTYRATE							0.0870

Ingredient	Group	H	I	J	K	L	M
INDOFLO			0.0010				
INDOLE				0.0400			0.0087
IRISONE ALPHA					1.0000	1.0000	
ISOAMYL ACETATE		0.0455					0.0174
ISOBUTAVAN						0.1000	
JASMACYCLEN		0.9091					
JASMOPIRANE FORTE			1.1000				
JAVANOL				0.0533			
LIFFAROME							0.0435
MANGO BASE		2.2727					0.1739
MANZANATE							0.8696
MAYOL			0.5000			0.2000	0.0435
METHYL ANTHRANILATE				0.0667			
METHYL BENZOATE			0.0400				
METHYL ISOEUGENOL							0.1739
METHYL OCTYNE CARBONATE				0.0033			
METHYL SALICYLATE				0.0133			
MUSK KETONE					0.5000		
MUSK R1			0.2000				
NECTARYL			0.2000				
NEROL					0.0400		
NEROLIDOL					0.0100		
NEROLINE			0.0100			0.5000	
NEROLIONE				0.2667			
NONALACTONE GAMMA		0.1818	0.1000			6.5000	
NYPHEAL						0.5000	0.8696
OCTALACTONE GAMMA/DELTA						1.2000	
ORANGE FLOWER ETHER		0.0909					
OXYOCTALINE FORMATE					0.4000		
PAPAYA BASE		2.7273					
PHENYL ETHYL ACETATE						0.1000	
PHENYL ETHYL PHENYL ACETATE							0.0783
PRUNELLA BASE					2.0000		

Ingredient	Group	H	I	J	K	L	M
			wt%	wt%	wt%	wt%	wt%
RHODINOL					0.2500		
RHUBAFURAN			0.0060				
ROSE OIL					0.0100		
ROSYRANE SUPER						0.1000	
SANDALORE					1.4000		0.0870
TERPINYL ACETATE		0.0364					
TETRAHYDRO LINALOOL			2.8000			3.0000	
TOLYL ALDEHYDE PARA		0.2727					
TRIFERNAL						0.2000	
Sum		100	100	100	100	100	100
Total % INERT		44.99	34.06	47.32	10.24	10.95	10.71
No. of IMPU ingredients		4	1	3	2	3	7
Total % IMPU ingredients (excl. INERT)		6.61	1.82	4.18	1.89	10.84	6.04
Total % HMP ingredients (excl. INERT)		9.75	2.85	6.13	0.62	0.95	4.83
Total % HMI ingredients (excl. INERT)		13.55	0.02	0.10	0.11	7.86	5.38
Total % HMR ingredients (excl. INERT)		4.96	30.24	17.97	28.68	20.27	7.45
Total % GEN ingredients (excl. INERT)		39.76	20.17	17.47	29.34	19.09	56.61
Total % RMP ingredients (excl. INERT)		0.83	28.51	31.51	2.01	8.42	4.20
HMPs + HMIs + GENs		14.71	33.09	24.10	29.30	21.22	12.28
IMPUs + IMPUs + HMPs + RMPs		59.92	22.01	21.74	31.35	37.79	68.03
IMPUs / (IMPUs + HMPs + RMPs)		0.38	0.05	0.10	0.42	0.54	0.40
IMPUs / (IMPUs + HMPs + RMPs + (100-TOTAL))		0.16	0.04	0.06	0.05	0.21	0.20
RESULT		FAIL	FAIL	FAIL	FAIL	FAIL	FAIL

Example 4: Results of Functional Near Infrared Spectroscopy Testing

fNIRS testing of fragrance compositions A through M described in Example 3 was conducted according to the method described in Example 1. A non-odour control was used as the benchmark.

As a first level, conditions A1 through A10 were investigated:

- 5 A1. Channel 14 shows a statistically significant decrease of Total Hb after 30 seconds of smelling;
- A2. Channel 19 shows a statistically significant increase of Total Hb after 30 seconds of smelling;
- A3. Channel 17 shows a statistically significant decrease of Oxy Hb after 0-5 seconds of smelling;
- 10 A4. Channel 4 shows a statistically significant increase of Total Hb after 0-5 seconds of smelling;
- A5. Channel 5 shows a statistically significant increase of Total Hb after 0-5 seconds of smelling;
- A6. Channel 17 shows a statistically significant decrease of Oxy Hb after 0-10 seconds of smelling;
- A7. Channel 19 shows a statistically significant increase of Total Hb after 0-10 seconds of smelling;
- 15 A8. Channel 17 shows a statistically significant decrease of Oxy Hb after 5-10 seconds of smelling;
- A9. Channel 17 shows a statistically significant decrease of Total Hb after 5-10 seconds of smelling;
- 20 A10. Channel 18 shows a statistically significant decrease of Total Hb after 5-10 seconds of smelling.

Based on extensive testing, it had been determined that at least four out of the ten conditions A1 through A10 (Criterion A) are met in case a fragrance composition provides an invigorating effect.

The results of the first level fNIRS testing are shown in the following two tables:

Condition		A	B	C	D	E	F	G
A1	Test Fragrance	-0.104	-0.014	-0.038	0.095	0.123	-0.029	-0.116
	Benchmark	0.057	0.022	0.040	-0.147	0.051	0.040	0.098
	Condition met	Yes	No	Yes	No	No	Yes	Yes
A2	Test Fragrance	0.080	-0.074	-0.181	0.183	0.069	0.283	-0.032
	Benchmark	0.043	-0.083	-0.021	0.036	0.069	-0.021	0.077
	Condition met	Yes	No	No	Yes	No	Yes	No

A3	Test Fragrance	0.251	-0.076	-0.226	-0.050	0.230	-0.247	0.115
	Benchmark	0.087	0.113	-0.045	-0.117	0.400	-0.045	-0.142
	Condition met	No	Yes	Yes	No	Yes	Yes	No
A4	Test Fragrance	0.018	0.236	0.127	0.478	0.494	0.114	0.183
	Benchmark	0.118	-0.037	-0.148	0.228	0.314	-0.148	0.135
	Condition met	No	Yes	Yes	Yes	Yes	Yes	Yes
A5	Test Fragrance	0.141	0.021	0.022	0.195	0.603	0.057	0.231
	Benchmark	0.052	-0.102	-0.018	0.053	0.403	-0.018	0.011
	Condition met	Yes	Yes	Yes	Yes	Yes	Yes	Yes
A6	Test Fragrance	0.211	-0.083	-0.151	-0.114	0.054	-0.169	0.008
	Benchmark	0.052	0.065	-0.003	-0.166	0.207	-0.003	-0.204
	Condition met	No	Yes	Yes	No	Yes	Yes	No
A7	Test Fragrance	0.189	-0.301	-0.125	0.343	0.109	0.247	0.110
	Benchmark	0.012	-0.177	0.087	0.182	0.309	0.087	0.041
	Condition met	Yes	No	No	Yes	No	Yes	Yes
A8	Test Fragrance	0.171	-0.091	-0.077	-0.177	-0.121	-0.093	-0.097
	Benchmark	0.017	0.018	0.037	-0.214	0.013	0.037	-0.265
	Condition met	No	Yes	Yes	No	Yes	Yes	No
A9	Test Fragrance	-0.005	-0.225	-0.022	-0.227	-0.070	-0.051	-0.153
	Benchmark	0.017	0.041	0.015	-0.223	0.085	0.015	-0.252
	Condition met	No	Yes	Yes	No	Yes	Yes	No
A10	Test Fragrance	0.069	-0.267	-0.026	-0.214	0.120	0.096	0.098
	Benchmark	0.107	-0.097	0.067	-0.129	-0.058	0.067	-0.132
	Condition met	No	Yes	Yes	Yes	No	No	No
Number of conditions A1-A10 met		4	7	8	5	6	9	4
Invigorating effect?		YES	YES	YES	YES	YES	YES	YES

Condition		H	I	J	K	L	M
A1	Test Fragrance	-0.070	0.078	-0.085	-0.012	0.112	-0.112
	Benchmark	-0.023	0.057	0.141	0.057	0.051	-0.022
	Condition met	Yes	No	Yes	Yes	No	Yes
A2	Test Fragrance	0.034	-0.177	-0.196	-0.084	-0.041	-0.093
	Benchmark	-0.048	0.043	0.025	0.043	0.069	-0.113
	Condition met	Yes	No	No	No	No	No
A3	Test Fragrance	-0.057	0.217	-0.140	0.160	0.264	0.107
	Benchmark	0.005	0.087	0.098	0.087	0.400	0.147
	Condition met	Yes	No	Yes	No	Yes	No
A4	Test Fragrance	0.003	0.079	-0.343	0.166	0.303	0.218
	Benchmark	-0.175	0.118	-0.113	0.118	0.314	0.165
	Condition met	Yes	No	No	No	No	Yes
A5	Test Fragrance	0.007	-0.086	-0.002	0.068	0.442	0.241
	Benchmark	0.164	0.052	0.027	0.052	0.403	0.318
	Condition met	No	No	No	No	No	No
A6	Test Fragrance	-0.079	0.005	-0.191	0.068	0.160	0.033
	Benchmark	-0.042	0.052	0.091	0.052	0.207	-0.087
	Condition met	Yes	No	Yes	No	No	No

A7	Test Fragrance	0.159	-0.092	-0.061	-0.023	0.228	0.138
	Benchmark	0.115	0.012	0.113	0.012	0.309	-0.019
	Condition met	Yes	No	No	No	No	Yes
A8	Test Fragrance	-0.099	-0.202	-0.241	-0.022	0.056	-0.041
	Benchmark	-0.089	0.017	0.084	0.017	0.013	-0.322
	Condition met	No	Yes	Yes	No	No	No
A9	Test Fragrance	0.013	-0.294	-0.158	0.159	0.114	0.082
	Benchmark	-0.076	0.017	0.243	0.017	0.085	-0.175
	Condition met	No	Yes	Yes	No	No	No
A10	Test Fragrance	0.005	-0.268	-0.267	0.037	0.118	-0.007
	Benchmark	0.074	0.107	0.091	0.107	-0.058	-0.139
	Condition met	Yes	Yes	Yes	Yes	No	No
Number of conditions A1-A10 met		7	3	6	2	1	3
Invigorating effect?		YES	NO	YES	NO	NO	NO

For those compositions that fulfilled Criterion A (Compositions A-H and J), a further investigation of specific fNIRS channels and time points was conducted. Specifically, it was tested if any of the following further conditions B1 through B6 and/or C1 through C10 were met:

- 5 B1. Deoxy Hb for the full brain shows a statistically significant decrease after 0-5 seconds of smelling;
- B2. Deoxy Hb for the right brain hemisphere shows a statistically significant decrease after 0-5 seconds of smelling;
- B3. Total Hb for the full brain shows a statistically significant increase after 0-5 seconds of smelling;
- 10 B4. Total Hb for the left brain hemisphere shows a statistically significant increase after 0-5 seconds of smelling;
- B5. Deoxy Hb for the left brain hemisphere shows a statistically significant decrease after 5-10 seconds of smelling;
- 15 B6. Oxy Hb for the left brain hemisphere shows a statistically significant increase after 0-5 seconds of smelling;
- C1. Channel 19 shows a statistically significant increase of Deoxy Hb after 30 seconds of smelling;
- C2. Channel 6 shows a statistically significant increase of Oxy Hb after 30 seconds of smelling;
- C3. Channel 19 shows a statistically significant increase of Oxy Hb after 30 seconds of smelling;
- 20 C4. Channel 10 shows a statistically significant decrease of Total Hb after 30 seconds of smelling;
- C5. Channel 11 shows a statistically significant increase of Deoxy Hb after 0-5 seconds of smelling;

- 5 C6. Channel 20 shows a statistically significant increase of Deoxy Hb after 0-5 seconds of smelling;
- C7. Channel 8 shows a statistically significant increase of Oxy Hb after 0-5 seconds of smelling;
- C8. Channel 20 shows a statistically significant increase of Deoxy Hb after 0-10 seconds of smelling;
- C9. Channel 7 shows a statistically significant increase of Oxy Hb after 0-10 seconds of smelling;
- C10. Channel 4 shows a statistically significant increase of Total Hb after 0-10 seconds of smelling.

10 It was found that fragrance compositions led to a more pronounced improvement of the invigoration state if at least at least five out of the six conditions B1 through B6 (Criterion B') and/or at least nine out of the 20 conditions A1 through A10 and C1 through C10 (Criterion C') were met.

The results of this second level fNIRS testing are shown in the following two tables:

Condition		A	B	C	D	E	F	G	H	J
B1	Test Fragrance	-0.110	0.055	-0.176	-0.059	0.115	-0.136	-0.186	-0.148	-0.105
	Benchmark	0.006	-0.016	0.058	-0.011	-0.041	0.058	0.058	-0.132	0.012
	Condition met	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
B2	Test Fragrance	-0.120	-0.023	-0.227	-0.058	0.019	-0.204	-0.256	-0.122	-0.086
	Benchmark	0.019	0.012	0.076	-0.035	-0.058	0.076	0.008	-0.189	0.072
	Condition met	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
B3	Test Fragrance	0.163	0.057	-0.098	0.172	0.213	-0.085	0.192	0.021	-0.111
	Benchmark	0.074	-0.011	-0.144	0.079	0.212	-0.144	0.124	0.128	0.109
	Condition met	Yes	Yes	Yes	Yes	No	Yes	No	No	No
B4	Test Fragrance	0.203	0.154	-0.057	0.218	0.249	0.015	0.249	-0.016	-0.168
	Benchmark	0.088	-0.015	-0.126	0.096	0.165	-0.126	0.139	0.077	0.014
	Condition met	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
B5	Test Fragrance	-0.207	0.111	-0.040	-0.074	0.211	-0.003	-0.011	0.031	0.093
	Benchmark	-0.045	0.053	0.081	0.067	0.055	0.081	0.226	0.029	0.132
	Condition met	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
B6	Test Fragrance	0.140	0.103	-0.024	0.259	0.239	0.015	0.252	0.041	-0.146
	Benchmark	0.017	-0.021	-0.153	0.100	0.207	-0.126	0.121	0.091	0.055
	Condition met	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Number of conditions B1-B6 met		6	4	6	6	2	6	5	0	3
Criterion B' met?		YES	NO	YES	YES	NO	YES	YES	NO	NO

Condition		A	B	C	D	E	F	G	H	J
C1	Test Fragrance	-0.027	-0.055	0.007	0.170	0.014	-0.032	-0.087	-0.057	0.104
	Benchmark	-0.157	-0.076	-0.064	0.052	-0.002	-0.064	-0.048	-0.082	0.010
	Condition met	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes
C2	Test Fragrance	-0.033	-0.001	-0.088	0.053	-0.035	0.112	0.029	-0.006	-0.251
	Benchmark	0.097	0.037	-0.036	-0.150	0.048	-0.036	0.030	-0.027	0.022
	Condition met	No	No	No	Yes	No	Yes	No	No	No
C3	Test Fragrance	0.122	-0.070	-0.149	0.145	0.064	0.265	0.090	0.052	-0.255
	Benchmark	0.095	-0.065	-0.025	0.023	0.080	-0.025	0.087	-0.006	0.016
	Condition met	Yes	No	No	Yes	No	Yes	No	Yes	No

Condition		A	B	C	D	E	F	G	H	J
C4	Test Fragrance	-0.094	0.026	-0.007	0.152	-0.070	0.057	0.007	-0.150	-0.247
	Benchmark	0.159	0.194	0.042	-0.129	0.023	-0.040	-0.033	0.088	0.199
	Condition met	Yes	Yes	No	No	Yes	No	No	Yes	Yes
C5	Test Fragrance	-0.038	0.205	-0.390	0.130	0.417	-0.174	0.046	-0.078	-0.210
	Benchmark	-0.206	0.067	0.199	0.179	0.454	0.199	0.129	-0.024	-0.157
	Condition met	Yes	Yes	No	No	No	No	No	No	No
C6	Test Fragrance	-0.139	-0.263	-0.268	-0.013	-0.155	-0.042	-0.340	-0.152	0.011
	Benchmark	0.139	-0.246	0.092	-0.076	-0.141	0.092	0.143	-0.322	0.094
	Condition met	No	No	No	Yes	No	No	No	Yes	No
C7	Test Fragrance	0.451	0.158	0.031	0.343	0.144	-0.053	0.280	-0.025	-0.130
	Benchmark	0.340	0.071	-0.262	0.029	0.077	-0.262	0.223	0.229	0.164
	Condition met	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
C8	Test Fragrance	-0.161	-0.122	-0.137	0.027	0.045	0.049	-0.190	-0.077	0.044
	Benchmark	0.041	-0.117	0.089	-0.123	0.002	0.089	0.147	-0.273	0.105
	Condition met	No	No	No	Yes	No	No	No	Yes	No
C9	Test Fragrance	0.414	0.140	-0.186	0.051	0.282	-0.090	0.139	-0.002	-0.278
	Benchmark	0.044	0.088	-0.113	-0.017	0.294	-0.113	0.096	0.034	0.081
	Condition met	Yes	No	No	No	No	No	No	No	No
C10	Test Fragrance	0.040	0.170	0.137	0.355	0.368	0.201	0.123	0.015	-0.204
	Benchmark	0.103	-0.062	-0.108	0.141	0.222	-0.108	0.126	-0.204	-0.042
	Condition met	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Number of conditions C1-C10 met		6	4	3	7	3	5	0	6	2
Number of conditions A1-A10 met		4	7	8	5	6	9	4	7	6
Criterion C' fulfilled?		YES	YES	YES	YES	YES	YES	NO	YES	NO

Thus, Compositions A-H fulfilled at least one of Criterion B' and Criterion C', whereas Composition J did not fulfil either of them. Out of those that passed this second level of fNIRS testing, Compositions A, C, D, and F fulfilled both Criterion B' and Criterion C'.

An even better distinction between the fragrance compositions was found to be possible if also
5 Criterion D' was assessed, which requires:

- that at least eight out of the ten conditions A1 through A10 are met if zero or one out of the six conditions B1 through B6 are met;
- that at least six out of the ten conditions A1 through A10 are met if two or three out of the six conditions B1 through B6 are met; and
- 10 - that at least four out of the ten conditions A1 through A10 are met if four, five or six out of the six conditions B1 through B6 are met.

Criterion D' was only applied to those compositions that fulfilled at least one of Criterion B' and Criterion C' (Compositions A-H). The results are shown in the following table:

	A	B	C	D	E	F	G	H
Number of conditions A1-A10 met	4	7	8	5	6	9	4	7
Number of conditions B1-B6 met	6	4	6	6	2	6	5	0
Criterion D' fulfilled?	YES	YES	YES	YES	YES	YES	YES	NO

It has been found that the additional Criteria B, C and D lead to an improved accuracy for predicting
15 the effect on invigoration achieved by the fragrance compositions. Consequently, the rules for preparing the fragrance compositions of the invention were devised such that the respective fragrance compositions pass even the highest level of fNIRS testing, i.e. Criterion D.

Furthermore, fNIRS testing shows very specific brain signatures at both group level (i.e. full brain and/or hemispherical averages) and at single channel level, making the validation test so thorough
20 that only fragrance compositions and fragrance ingredients truly providing an invigorating effect to the participant can pass it.

Thus, the compositions of the present invention were found to provide an invigoration on the sub-conscious level.

Example 5: Results from Questionnaire

25 The following table shows an example for results obtained with the questionnaire used in Example 2 (15 participants). Composition G of Example 3 is the test fragrance; a non-odour control was

used as the benchmark; Fragrance 1 is composition Q of Example 6 described below; Fragrances 2, and 3 are comparative examples which were not previously described in this disclosure.

	Composition	Liking (1-9)	Strength (1-9)	Invigorating (1-9)	Relaxing (1-9)	Happy (1-9)
Test	G	6.667	6.000	5.333	4.533	5.067
Fragrance 1	Q	6.800	6.800	5.400	4.667	5.267
Fragrance 2	-	6.867	6.600	6.000	4.800	5.467
Fragrance 3	-	7.067	5.800	4.733	5.333	5.467
Benchmark	-	4.733	1.600	1.467	1.867	1.933

It is worth mentioning that the outlined invigorating effect at brain level does not depend on the liking of the fragrances: paired t-tests run on Liking scores between the test fragrance and all the other fragrance compositions tested were non-significant, with all p values being larger than 0.5. Therefore, the invigorating effect is exclusively due to the composition and not the hedonic character of the fragrance. Furthermore, the data shown in the above table highlight the limitations of consumer tests at differentiating moods based solely on explicit, declarative responses. In fact, there is no significant difference between mood ratings of the same fragrance and mood ratings across the fragrances tested. The only significant difference that has been highlighted regards the presence or absence of fragrance, which is unrelated to the specific mood of the fragrance.

Example 6: Results of Mood Portraits® Testing

In addition to the fNIRS testing, a Mood Portraits® study as described in Example 2 was also conducted on a large number of fragrance compositions.

- For the present invention, the results of the Mood Portraits® study were analysed with regard to an invigorated mood. Specifically, the selection frequency of pictures associated with invigoration and the grade of association of the respective pictures with a positive activated mood (some pictures are very strongly associated with invigoration, whereas it is only one association among several equally strong ones for other pictures) were taken into account.
- A comparison of several dozen fragrance compositions showed that most of them have a very similar effect on invigoration; but a few fragrance compositions are able to significantly evoke or not evoke an invigorated mood.

Figure 2 shows the results for some of the fragrance compositions that were tested, namely for Compositions G (according to the invention) and K and L (comparative examples) of Example 3, and of Compositions N through T, which were not previously described in this disclosure.

5 More precisely, Figure 2 shows the odds ratio for an energized/focused/invigorated mood, indicating for each fragrance composition if it evokes an invigorated mood more or less than the other compositions. The odds ratios are shown as dots. If the 95% confidence interval for the odds ratio for a fragrance composition is entirely above the Significance Line of 1.0, then said fragrance composition significantly evokes a more invigorated mood and is marked in Figure 2 by an arrow; if the 95% confidence interval for a fragrance composition is entirely below the Significance Line
10 of 1.0, then said fragrance composition significantly evokes a less invigorated mood.

Thus, as can be seen from Figure 2, Composition G, which is a fragrance composition according to the present invention, is able to evoke an invigorated mood significantly more than all the other fragrance compositions. Compositions K, L on the other hand evoked a significantly less invigorated mood than the others. Compositions N through T essentially lie on the Significance
15 Line.

Thus, the Mood Portraits® results confirm that Composition G, which has been found to be invigorating in the fNIRS study and which also complies with the formulation guidelines of the present invention, significantly evokes more invigoration compared to a large majority of other fragrance compositions.

Claims

1. A method of assessing the ability of a test fragrance ingredient or a test fragrance composition to improve the invigoration state of a human subject, comprising the steps of:
- 5 a) measuring a base invigoration state of one or more human test subject(s);
- b) providing the test fragrance ingredient or the test fragrance composition to the human test subject(s) for smelling;
- c) measuring a resulting invigoration state of the human test subject(s); and
- d) determining a difference between the resulting invigoration state and the base invigoration state for the human test subject(s);
- 10 wherein the base invigoration state and the resulting invigoration state are measured by functional Near Infrared Spectroscopy (fNIRS) of the human test subject(s)' left brain hemisphere, right brain hemisphere, and full brain;
- wherein the test fragrance ingredient or the test fragrance composition is able to improve the invigoration state of the human subject if Criterion A is met, wherein Criterion A requires
- 15 at least four out of the following ten conditions A1 through A10 are met:
- A1. Channel 14 shows a statistically significant decrease of Total Hb after 30 seconds of smelling;
- A2. Channel 19 shows a statistically significant increase of Total Hb after 30 seconds of smelling;
- 20 A3. Channel 17 shows a statistically significant decrease of Oxy Hb after 0-5 seconds of smelling;
- A4. Channel 4 shows a statistically significant increase of Total Hb after 0-5 seconds of smelling;
- A5. Channel 5 shows a statistically significant increase of Total Hb after 0-5 seconds of smelling;
- 25 A6. Channel 17 shows a statistically significant decrease of Oxy Hb after 0-10 seconds of smelling;
- A7. Channel 19 shows a statistically significant increase of Total Hb after 0-10 seconds of smelling;
- 30 A8. Channel 17 shows a statistically significant decrease of Oxy Hb after 5-10 seconds of smelling;

A9. Channel 17 shows a statistically significant decrease of Total Hb after 5-10 seconds of smelling;

A10. Channel 18 shows a statistically significant decrease of Total Hb after 5-10 seconds of smelling;

5 wherein Channels 1 to 8 and 11 are located in the left brain hemisphere, Channels 9 and 12 are located on the midline, and Channels 10 and 13 to 20 are located in the right brain hemisphere.

2. The method of claim 1, wherein at least five out of the ten conditions A1 through A10 are met, more preferably at least six, and most preferably at least seven.

10 3. The method of claim 1 or 2, wherein further at least one of Criterion B and Criterion C is met, wherein Criterion B requires that at least four, more preferably at least five, and most preferably all six, out of the following six conditions B1 through B6 are met:

B1. Deoxy Hb for the full brain shows a statistically significant decrease after 0-5 seconds of smelling;

15 B2. Deoxy Hb for the right brain hemisphere shows a statistically significant decrease after 0-5 seconds of smelling;

B3. Total Hb for the full brain shows a statistically significant increase after 0-5 seconds of smelling;

20 B4. Total Hb for the left brain hemisphere shows a statistically significant increase after 0-5 seconds of smelling;

B5. Deoxy Hb for the left brain hemisphere shows a statistically significant decrease after 5-10 seconds of smelling;

B6. Oxy Hb for the left brain hemisphere shows a statistically significant increase after 0-5 seconds of smelling;

25 wherein Deoxy Hb is the amount of deoxygenated haemoglobin measured, wherein Total Hb is the amount of total haemoglobin measured, and wherein Oxy Hb is the amount of oxygenated haemoglobin measured; and

30 wherein Criterion C requires that at least eight, more preferably at least nine, and most preferably at least 10, out of the following 20 conditions A1 through A10 and C1 through C10 are met:

- 5 A1. Channel 14 shows a statistically significant decrease of Total Hb after 30 seconds of smelling;
- A2. Channel 19 shows a statistically significant increase of Total Hb after 30 seconds of smelling;
- 10 A3. Channel 17 shows a statistically significant decrease of Oxy Hb after 0-5 seconds of smelling;
- A4. Channel 4 shows a statistically significant increase of Total Hb after 0-5 seconds of smelling;
- A5. Channel 5 shows a statistically significant increase of Total Hb after 0-5 seconds of smelling;
- 15 A6. Channel 17 shows a statistically significant decrease of Oxy Hb after 0-10 seconds of smelling;
- A7. Channel 19 shows a statistically significant increase of Total Hb after 0-10 seconds of smelling;
- A8. Channel 17 shows a statistically significant decrease of Oxy Hb after 5-10 seconds of smelling;
- A9. Channel 17 shows a statistically significant decrease of Total Hb after 5-10 seconds of smelling;
- 20 A10. Channel 18 shows a statistically significant decrease of Total Hb after 5-10 seconds of smelling;
- C1. Channel 19 shows a statistically significant increase of Deoxy Hb after 30 seconds of smelling;
- C2. Channel 6 shows a statistically significant increase of Oxy Hb after 30 seconds of smelling;
- 25 C3. Channel 19 shows a statistically significant increase of Oxy Hb after 30 seconds of smelling;
- C4. Channel 10 shows a statistically significant decrease of Total Hb after 30 seconds of smelling;
- 30 C5. Channel 11 shows a statistically significant increase of Deoxy Hb after 0-5 seconds of smelling;
- C6. Channel 20 shows a statistically significant increase of Deoxy Hb after 0-5 seconds of smelling;
- C7. Channel 8 shows a statistically significant increase of Oxy Hb after 0-5 seconds of smelling;

C8. Channel 20 shows a statistically significant increase of Deoxy Hb after 0-10 seconds of smelling;

C9. Channel 7 shows a statistically significant increase of Oxy Hb after 0-10 seconds of smelling;

5 C10. Channel 4 shows a statistically significant increase of Total Hb after 0-10 seconds of smelling;

wherein Channels 1 to 8 and 11 are located in the left brain hemisphere, Channels 9 and 12 are located on the midline, and Channels 10 and 13 to 20 are located in the right brain hemisphere.

10 4. The method of claim 3, wherein both Criterion B and Criterion C are met.

5. The method of claim 3 or 4, wherein further Criterion D is met, wherein Criterion D requires:

- that at least seven, more preferably at least eight, and most preferably at least nine, out of the ten conditions A1 through A10 are met if zero or one out of the six conditions B1 through B6 are met;
 - 15 - that at least five, more preferably at least six, and most preferably at least seven, out of the ten conditions A1 through A10 are met if two or three out of the six conditions B1 through B6 are met; and
 - that at least four, more preferably at least five, and most preferably at least six, out of the ten conditions A1 through A10 are met if four, five or six out of the six conditions B1 through B6 are met.
- 20

6. A method of creating a fragrance composition having effect of improving the invigoration state of a human subject, comprising the steps of:

- (i) creating a test fragrance composition;
- (ii) assessing the ability of the test fragrance composition to improve the invigoration state of a human subject according to the method of any one of claims 1 to 5; and
- 25 (iii) adjusting, if necessary, the test fragrance composition by adding and/or removing at least one fragrance ingredient and/or increasing and/or reducing the concentration of at least one fragrance ingredient until the fragrance composition is found to improve the invigoration state of the human subject.

30 7. The method of claim 6, wherein, in step (iii), at least one IMPU fragrance ingredient is added to the test fragrance composition and/or at least one HMI fragrance ingredient is added to

the test fragrance composition and/or at least one RMP fragrance ingredient is removed from the test fragrance composition and/or the concentration of at least one IMPU and/or HMI fragrance ingredient is increased and/or the concentration of at least RMP fragrance ingredient is reduced, wherein

- 5 - the IMPU fragrance ingredients are selected from the group consisting of aromatic-eucalyptus ingredients, aromatic-mint ingredients, aromatic-rosemary ingredients, citrus-lime ingredients, spicy-pepper ingredients, citrus-floral/lemon ingredients, lavandin oil, patchouli oil, clary sage oil, orange flower oil, guaiacwood oil, oakmoss oil, litsea cubeba oil, citral, benzyl 2-hydroxybenzoate (benzyl salicylate), 2-methyl-3-(4-(1-methylethyl)phenyl)propanal (cyclamen aldehyde), 3-(4-ethylphenyl)-2,2-dimethylpropanal (floralozone), prop-2-enyl 2-(3-methylbutoxy)acetate (allyl amyl glycolate), prop-2-enyl 2-cyclohexyloxyacetate (cyclogalbanate), 4-methyl-2-(2-methylprop-1-en-1-yl)tetrahydro-2H-pyran (rose oxide), 1-[(2Z,5Z,9Z)-2,6,10-trimethylcyclododeca-2,5,9-trien-1-yl]ethanone (trimofix O or cyclisone), methyl 2,4-dihydroxy-3,6-dimethylbenzoate (Evernyl or Everniate), 2,6-dimethylheptan-2-ol (dimetol), 3,7-dimethylocta-1,6-dien-3-yl acetate (linalyl acetate) fir balsam oil, pine needle base, and mixtures thereof;
- 10 - the HMI fragrance ingredients are selected from the group consisting of citrus-orange ingredients, citrus-mandarin ingredients, 1-(2-tert-butylcyclohexyl)oxybutan-2-ol (amber core), (3aR,5aS,9aS,9bR)-3a,6,6,9a-tetramethyl-2,4,5,5a,7,8,9,9b-octahydro-1H-benzo[e][1]benzofuran (ambrofix or ambroxan), 5,5,9-tetramethyl-13-oxatricyclo(8.3.0.0.(4.9))tridecane (cetalox or fixambrene), 2,6-dimethyloct-7-en-2-ol (dihydromyrcenol), 3-(1,3-benzodioxol-5-yl)-2-methylpropanal (helional or tropional), (2-tert-butylcyclohexyl) acetate (agrumex), 1-(2,6,6-trimethyl-1-cyclohex-2-enyl)but-3-en-1-one (damascone alpha), 2,4-dimethyl-3-cyclohexene-1-carbaldehyde (cyclal C or tricyclal or ligustral), 4-allyl-2-methoxyphenol (eugenol), and mixtures thereof; and
- 15 - the RMP fragrance ingredients are selected from the group consisting of 2-(4-methylcyclohex-3-en-1-yl)propan-2-ol (terpineol), hexyl 2-hydroxybenzoate (hexyl salicylate), jasmin oil, 7-hydroxy-3,7-dimethyloctanal (hydroxycitronellal), 3-methyl-5-phenylpentanol (Mefrosol), 2-(phenoxy)ethyl 2-methylpropanoate (phenoxyethyl isobutyrate), (12E)-1-oxacyclohexadec-12-en-2-one (Habanolide), 4-methoxybenzaldehyde (aubepine para cresol, anisic aldehyde), benzoin resinoids, 3-ethoxy-4-hydroxybenzaldehyde (ethyl vanillin), 4-hydroxy-3-methoxybenzaldehyde (vanillin),
- 20
- 25
- 30

2-ethyl-4(2',2',3'-trimethylcyclopent-3-enyl)but-enol (Bangalol or Radjanol), mixtures of 2-methyl-1-phenylpropan-2-yl butanoate and (phenoxy)ethyl 2-methylpropanoate (Prunella), and mixtures thereof.

8. A fragrance composition for improving the invigoration state of a human subject, the fragrance composition comprising at least 75%, preferably at least 85%, of fragrance ingredients drawn from the following groups:

- a) at least three IMPU fragrance ingredients;
- b) at least about 10% by weight in total of IMPU fragrance ingredients;
- c) optionally up to about 90% by weight in total of HMR, HMI, HMP, RMP and/or GEN fragrance ingredients, provided the following conditions are met:

$$(c1) \quad \text{IMPU} \geq \text{HMP} + \text{HMR}$$

$$(c2) \quad \text{IMPU} + \text{HMI} + \text{GEN} \geq 65\%;$$

$$(c3) \quad (\text{IMPU} + \text{HMI}) / (\text{IMPU} + \text{HMI} + \text{RMP} + \text{HMR}) \geq 0.7$$

$$(c4) \quad \text{IMPU} / (\text{IMPU} + \text{HMP} + \text{RMP}) \geq 0.5$$

$$(c5) \quad \text{IMPU} / (\text{HMP} + \text{RMP} + \text{IMPU}) + (100 - \text{TOTAL}) \geq 0.3$$

wherein

- (i) all percentages are based on total weight of the fragrance ingredients constituting the fragrance composition;
- (ii) IMPU indicates the sum of percentages of IMPU fragrance ingredients; HMP indicates the sum of percentages of HMP fragrance ingredients; HMR indicates the sum of percentages of HMR fragrance ingredients; HMI indicates the sum of percentages of HMI fragrance ingredients; RMP indicates the sum of percentages of RMP fragrance ingredients; GEN indicates the sum of percentages of GEN fragrance ingredients; and TOTAL indicates the sum of HMPs, HMRs, HMIs, IMPU, RMPs, and GENs; provided that low odour or no odour solvents, diluents and other vehicles are excluded from the calculation of these sums;
- (iii) the symbol $\geq$ indicates at least equal to;
- (iv) the IMPU fragrance ingredients are selected from the group consisting of aromatic-eucalyptus ingredients, aromatic-mint ingredients, aromatic-rosemary ingredients, citrus-lime ingredients, spicy-pepper ingredients, citrus-floral/lemon ingredients, lavandin oil, patchouli oil, clary sage oil, orange flower oil, guaiacwood oil, oakmoss oil, litsea cubeba oil, citral, benzyl 2-hydroxybenzoate (benzyl salicylate), 2-methyl-

- 3-(4-(1-methylethyl)phenyl)propanal (cyclamen aldehyde), 3-(4-ethylphenyl)-2,2-dimethylpropanal (floralozone), prop-2-enyl 2-(3-methylbutoxy)acetate (allyl amyl glycolate), prop-2-enyl 2-cyclohexyloxyacetate (cyclogalbanate), 4-methyl-2-(2-methylprop-1-en-1-yl)tetrahydro-2H-pyran (rose oxide), 1-[(2Z,5Z,9Z)-2,6,10-trimethylcyclododeca-2,5,9-trien-1-yl]ethanone (trimofix O or cyclisone), methyl 2,4-dihydroxy-3,6-dimethylbenzoate (Evernyl or Everniate), 2,6-dimethylheptan-2-ol (dimetol), 3,7-dimethylocta-1,6-dien-3-yl acetate (linalyl acetate) fir balsam oil, pine needle base, and mixtures thereof;
- (v) the HMP fragrance ingredients are selected from the group consisting of fruity-candied fruit ingredients (excluding damascone alpha), fruity-strawberry ingredients, fruity-raspberry ingredients, fruity-pineapple ingredients, grapefruit oil, 6,6-dimethoxy-2,5,5-trimethylhex-2-ene (methyl pamplemousse), hexenyl-3-salicylate, ylang ylang oil, ethyl 3-oxobutanoate (ethyl acetoacetate), 5-hexyloxolan-2-one (gamma decalactone), 5-octyloxolan-2-one (dodecalatone gamma), 2,2,5-trimethyl-5-pentylcyclopentan-1-one (veloutone), hexyl acetate, cassis base, 1-phenylethyl acetate (styrallyl acetate), (E)-4-methyldec-3-en-5-ol (undecavertol), 2-ethyl-3-hydroxypyran-4-one (ethyl maltol), 8-methyl-1,5-benzodioxepin-3-one (calone), 1-[(1R,2R,5S,7R)-2,6,6,8-tetramethyl-9-tricyclo[5.3.1.0^{1,5}]undec-8-enyl]ethanone (methyl cedryl ketone or vertofix coeur), and mixtures thereof;
- (vi) the HMR fragrance ingredients are selected from the group consisting of lemon oil, (E)-3,7-dimethylnona-1,6-dien-3-ol (ethyl linalool), benzyl acetate, 3-methyl-2-[(Z)-pent-2-enyl]cyclopent-2-en-1-one (jasmane-cis), 2-(2'-methylpropyl)-4-hydroxy-4-methyltetrahydropyran (Florosa), (E)-1-(2,6,6-trimethylcyclohex-2-en-1-yl)hepta-1,6-dien-3-one (cetone V), N-1-(2,6,6-trimethyl-1-cyclohex-2-enyl)pent-1-en-3-one (Isoraldeine), 3,7-dimethyloct-6-en-1-ol (citronellol), (E)-3,7-dimethylocta-2,6-dien-1-ol (geraniol), geranium oil, 4-(4-hydroxy-4-methylpentyl)cyclohex-3-enecarbaldehyde (Lyrall, Cyclohexal), 5-heptyldihydrofuran-2(3H)-one (peach pure, undecalactone gamma), 1,4-dioxacycloheptadecane-5,17-dione (ethylene brassylate), mixtures of cyclohexadecanolide and cyclopentadecanone (Silvanone), (5E)-3-methylcyclopentadec-5-en-1-one (Muscenone), (E)-2-methoxy-4-(prop-1-en-1-yl)phenol (isoeugenol), and mixtures thereof;
- (vii) the HMI fragrance ingredients are selected from the group consisting of citrus-orange ingredients, citrus-mandarin ingredients, 1-(2-tert-butylcyclohexyl)oxy-

- butan-2-ol (amber core), (3aR,5aS,9aS,9bR)-3a,6,6,9a-tetramethyl-2,4,5,5a,7,8,9,9b-octahydro-1H-benzo[e][1]benzofuran (ambrofix or ambroxan), 5,5,9-tetramethyl-13-oxatricyclo(8.3.0.0.(4.9))tridecane (cetalox or fixambrene), 2,6-dimethyloct-7-en-2-ol (dihydromyrcenol), 3-(1,3-benzodioxol-5-yl)-2-methylpropanal (helional or tropional), (2-tert-butylcyclohexyl) acetate (agrumex), 1-(2,6,6-trimethyl-1-cyclohex-2-enyl)but-3-en-1-one (damascone alpha), 2,4-dimethyl-3-cyclohexene-1-carbaldehyde (cyclal C or tricyclal or ligustral), 4-allyl-2-methoxyphenol (eugenol), and mixtures thereof;
- (viii) the RMP fragrance ingredients are selected from the group consisting of 2-(4-methylcyclohex-3-en-1-yl)propan-2-ol (terpineol), hexyl 2-hydroxybenzoate (hexyl salicylate), jasmin oil, 7-hydroxy-3,7-dimethyloctanal (hydroxycitronellal), 3-methyl-5-phenylpentanol (Mefrosol), 2-(phenoxy)ethyl 2-methylpropanoate (phenoxyethyl isobutyrate), (12E)-1-oxacyclohexadec-12-en-2-one (Habanolide), 4-methoxybenzaldehyde (aubepine para cresol, anisic aldehyde), benzoin resinoids, 3-ethoxy-4-hydroxybenzaldehyde (ethyl vanillin), 4-hydroxy-3-methoxybenzaldehyde (vanillin), 2-ethyl-4-(2',2',3'-trimethylcyclopent-3-enyl)but-enol (Bangalol or Radjanol), mixtures of 2-methyl-1-phenylpropan-2-yl butanoate and (phenoxy)ethyl 2-methylpropanoate (Prunella), and mixtures thereof; and
- (ix) the GEN fragrance ingredients are selected from the group consisting of 3,7-dimethylocta-1,6-dien-3-ol (linalool), methyl 3-oxo-2-pentylcyclopentaneacetate (methyl dihydro-jasmonate, cepionate, hedione), hexyl cinnamic aldehyde, 3-(4-(1,1-dimethylethyl)phenyl)-2-methylpropanal (Lilial), (E)-4-(2,6,6-trimethylcyclohex-1-en-1-yl)but-3-en-2-one (ionone beta), 2-phenylethyl alcohol, 1-(2,3,8,8-tetramethyl-1,3,4,5,6,7-hexahydronaphthalen-2-yl)ethanone (sylvamber or iso e super or iso gamma super), 1,15-pentadecanolide (Thibetolide), -(isocamphyl-5)cyclohexanol (sandela), (3R,3aS,6R,7R,8aS)-octahydro-6-methoxy-3,6,8,8-tetramethyl-1H-3a,7-methanoazulene (cedryl methyl ether), and mixtures thereof.
9. The fragrance composition of claim 8, comprising at least about 15%, more preferably at least about 20%, by weight in total of IMPU fragrance ingredients.
 10. The fragrance composition of claim 8 or 9, comprising at least four IMPU fragrance ingredients, more preferably at least five IMPU fragrance ingredients.

11. The fragrance composition of any one of claims 8 to 10, comprising at least one IMPU and/or HMI fragrance ingredient selected from one or more of the following groups:
- one or more aromatic-eucalyptus ingredients selected from the group consisting of eucalyptus oil, 1-8 cineol (eucalyptol), and mixtures thereof;
 - 5 - one or more aromatic-mint ingredients selected from the group consisting of peppermint oil, spearmint oil, L- and D/L-2-isopropyl-5-methylcyclohexanol (L- and DL-menthol), [(1R,2S,5R)-5-methyl-2-propan-2-ylcyclohexyl] acetate (menthyl acetate), 2-butan-2-ylcyclohexan-1-one (freskomenthe), 5-methyl-2-prop-1-en-2-ylcyclohexan-1-ol (isopulegol), D/L- and L-2-isopropyl-5-methylcyclohexanone (D/L- and L-menthone), L- and D/L-2-isopropyl-5-methylcyclohexanone (L- and racemic isomenthone), and mixtures thereof;
 - 10 - one or more aromatic-rosemary ingredients selected from the group consisting of rosemary oil, (1R,2S,4R)-1,7,7-trimethylbicyclo[2.2.1]heptan-2-ol (borneol), (1R,4S,6R)-1,7,7-trimethylbicyclo[2.2.1]heptan-6-ol (iso-borneol), 1,7,7-trimethylbicyclo[2.2.1]heptan-2-one (camphor), 8,8-dimethyl-9-propan-2-yl-6,10-dioxaspiro[4.5]decane (opalal), 2-(5-methyl-5-vinyltetrahydro-2-furanyl)-2-propanol (linalool oxide), trans-methyl 1,4-dimethyl-cyclohexanecarboxylate (cyprisate), 2-ethenyl-2,6,6-trimethyloxane (limetol), 2-butyl-4,4,6-trimethyl-1,3-dioxane (herboxane), and mixtures thereof;
 - 15 - one or more citrus-lime ingredients selected from the group consisting of lime oil, lime terpenes, lime oxide, 1-methyl-4-(prop-1-en-2-yl)cyclohex-1-ene (dipentene), 1-methyl-4-propan-2-ylidenecyclohexene (terpinolene), (E)-3,7-dimethylocta-1,3,6-triene (ocimene), 1,1-diethoxy-3,7-dimethylocta-2,6-diene (citrathal), elemi oil, (4-methyl-1-isopropyl)benzene (para-cymene), 3,7,7-trimethylbicyclo[4.1.0]hept-3-ene (delta-3-carene), and mixtures thereof;
 - 20 - one or more spicy-pepper ingredients selected from the group consisting of ginger oil, nutmeg oil, olibanum oil, cardamom oil, copaiba balsam oil, curcuma oil, pepper oil, (4Z)-4,11,11-trimethyl-8-methylenebicyclo[7.2.0]undec-4-ene (caryophyllene), and mixtures thereof;
 - 25 - one or more citrus-floral/lemon ingredients selected from the group consisting of bergamot oil, coriander oil, coriander seed oil, and mixtures thereof;
 - 30 - one or more citrus-orange ingredients selected from the group consisting of orange oil, orange terpenes, orange aldehyde, and mixtures thereof; and/or

- one or more citrus-mandarin ingredients selected from the group consisting of mandarin oil, tangerine oil, (E)-6,10-dimethylundeca-5,9-dien-2-yl acetate (tangerinol), methyl 2-methylaminobenzoate (dimethyl anthranilate), octanol-3, and mixtures thereof.
12. The fragrance composition of any one of claims 8 to 11, wherein IMPUs + HMIs + GENs $\geq$ 70%, more preferably IMPUs + HMIs + GENs $\geq$ 75%, and most preferably IMPUs + HMIs + GENs $\geq$ 80%.
13. The fragrance composition of any one of claims 8 to 12, wherein (IMPUs + HMIs) / (IMPUs + HMIs + RMPs + HMRs) $\geq$ 0.72, more preferably (IMPUs + HMIs) / (IMPUs + HMIs + RMPs + HMRs) $\geq$ 0.75, and most preferably (IMPUs + HMIs) / (IMPUs + HMIs + RMPs + HMRs) $\geq$ 0.8.
14. The fragrance composition of any one of claims 8 to 13, wherein IMPUs / (IMPUs + HMPs + RMPs) $\geq$ 0.52, more preferably IMPUs / (IMPUs + HMPs + RMPs) $\geq$ 0.55, and most preferably IMPUs / (IMPUs + HMPs + RMPs) $\geq$ 0.6.
15. A consumer product comprising the fragrance composition according to any one of claims 8 to 14.
16. A method of improving the invigoration state of a human subject, comprising the step of providing an effective amount of the fragrance composition according to any one of claims 8 to 14 to the human subject.
17. Use of a fragrance ingredient for improving the invigoration state of a human subject, wherein the fragrance ingredient is selected from the group consisting of:
- one or more aromatic-eucalyptus ingredients selected from the group consisting of eucalyptus oil, 1-8 cineol (eucalyptol), and mixtures thereof;
 - one or more aromatic-mint ingredients selected from the group consisting of peppermint oil, L- and D/L-2-isopropyl-5-methylcyclohexanol (L- and DL-menthol), [(1R,2S,5R)-5-methyl-2-propan-2-ylcyclohexyl] acetate (menthyl acetate), 2-butan-2-ylcyclohexan-1-one (freskomenthe), 5-methyl-2-prop-1-en-2-ylcyclohexan-1-ol (isopulegol), D/L- and L-2-isopropyl-5-methylcyclohexanone (D/L- and L-menthone), L- and D/L-2-isopropyl-5-methylcyclohexanone (L- and racemic isomenthone), and mixtures thereof;
 - one or more aromatic-rosemary ingredients selected from the group consisting of 1R,2S,4R)-1,7,7-trimethylbicyclo[2.2.1]heptan-2-ol (borneol), (1R,4S,6R)-1,7,7-

- trimethylbicyclo[2.2.1]heptan-6-ol (iso-borneol), 1,7,7-trimethylbicyclo[2.2.1]heptan-2-one (camphor), 8,8-dimethyl-9-propan-2-yl-6,10-dioxaspiro[4.5]decane (opalal), 2-(5-methyl-5-vinyltetrahydro-2-furanyl)-2-propanol (linalool oxide), trans-methyl 1,4-dimethyl-cyclohexanecarboxylate (cyprisate), 2-ethenyl-2,6,6-trimethyloxane (limetol),
- 5 2-butyl-4,4,6-trimethyl-1,3-dioxane (herboxane), and mixtures thereof;
- one or more citrus-lime ingredients selected from the group consisting of lime oil, lime terpenes, lime oxide, 1-methyl-4-(prop-1-en-2-yl)cyclohex-1-ene (dipentene), 1-methyl-4-propan-2-ylidenecyclohexene (terpinolene), (E)-3,7-dimethylocta-1,3,6-triene (ocimene), 1,1-diethoxy-3,7-dimethylocta-2,6-diene (citrathal), elemi oil, (4-methyl-1-
 - 10 isopropylbenzene (para-cymene), 3,7,7-trimethylbicyclo[4.1.0]hept-3-ene (delta-3-carene), and mixtures thereof;
 - one or more spicy-pepper ingredients selected from the group consisting of cardamom oil, copaiba balsam oil, curcuma oil, pepper oil, (4Z)-4,11,11-trimethyl-8-methylenebicyclo[7.2.0]undec-4-ene (caryophyllene), and mixtures thereof;
 - 15 - one or more citrus-orange ingredients selected from the group consisting of orange aldehyde, and mixtures thereof; and/or
 - one or more citrus-mandarin ingredients selected from the group consisting of tangerine oil, (E)-6,10-dimethylundeca-5,9-dien-2-yl acetate (tangerinol), methyl 2-methylaminobenzoate (dimethyl anthranilate), octanol-3, and mixtures thereof.