CLAIMS

1. A method of characterising a scattering coloured pigment for use in the determination of the absorption and scattering coefficients of the scattering coloured pigment, the method comprising the step of:

i) obtaining a reflectance spectrum of a mixture of the scattering coloured pigment with a substantially non-absorbing scattering pigment at a plurality of different volume fractions wherein the substantially non-absorbing scattering pigment has a particle size greater than 0.6 microns.

2. A method according to claim 1, in which the method includes the step of:

ii) obtaining a scattering coefficient of the substantially non-absorbing scattering pigment as a function of volume fraction and wavelength.

3. A method according to claim 1 or claim 2, in which the method includes the step of determining the particle size of the scattering coloured pigment and selecting a non-absorbing scattering pigment having a particle size within 0.5 microns of the particle size of the scattering coloured pigment for performing characterisation therewith provided that the determined particle size is greater than 0.6 microns.

4. A method according to any preceding claim, in which the substantially non-absorbing scattering pigment comprises a large particle size titanium dioxide pigment.

5. A method according to any preceding claim, in which the scattering coloured pigment is a large particle size pigment having a particle size of greater than 0.6 microns.

6. A method according to any preceding claim, in which the scattering coloured pigment is selected from: Complex Inorganic Coloured Pigments; Nickel Antimony Titanate; Chrome Antimony Titanate; Manganese Antimony Titanate; Zinc Iron Chromite Brown Spinel; Chromium Green-Black Hematite; Cobalt Aluminate Blue Spinel; Cobalt Titanate Green Spinel; and Cobalt Chromite Green Spinel.

7. A method according to any preceding claim, in which the reflectance spectrum of the scattering coloured pigment is determined at least over wavelengths in the visible spectrum and infra-red.

8. A method according to any preceding claim, in which the reflectance spectrum of the scattering coloured pigment is determined over a wavelength range of 300nm to 2500nm.

9. A method according to any preceding claim, in which the method includes the steps of:

iii) obtaining an absorption coefficient of a weakly scattering black pigment as a function of wavelength at a plurality of different volume fractions; and

iv) obtaining a further reflectance spectrum of a mixture of the scattering coloured pigment with the black pigment at a plurality of different volume fractions.

10. A method according to claim 9, in which the reflectance spectrum and the further reflectance spectrum are obtained using an optically thick layer of the mixture.

11. A method according to claim 9 or claim 10, in which the method includes the step of:

v) combining the reflectance spectrum and further reflectance spectrum and calculating the Kubelka Munk absorption and scattering coefficients for the scattering coloured pigment as a function of scattering coloured pigment volume fraction and wavelength.

12. A method according to claim 11, in which the method includes the step of:

vi) determining the scattering coloured pigment volume fraction required to spectrally match a target reflection spectrum using the coefficients calculated in step (v).

13. A method according to claim 11, in which the method includes the step of:

(vii) programming a metering apparatus to prepare a formulation in accordance with the volume fraction calculated.

14. A method according to claim 12, in which steps (i), (iv) and (v) are repeated for different coloured pigments & step (vi) comprises determining the volume fraction of each coloured pigment to match the target colour.

15. A method according to any preceding claim, in which the reflectance spectra are obtained with a resolution of substantially 10nm.

16. A method according to claim 11, in which the method includes the step of calculating the total solar reflectance of the coloured pigment at the volume fraction determined to match the target colour, as a function of film thickness.

17. A method according to claim 16, in which the method includes the step of calculating the total solar reflectance over at least part of the visible spectrum and infra-red spectrum.

18. A method according to claim 17, in which the method includes the step of calculating the total solar reflectance over the wavelength range 300 to 2500 nm.

19. A pigment characterisation system adapted to perform the method of claim 1 to characterise a scattering coloured pigment.

20. A pigment characterisation system according to claim 19, in which the system includes a target colour matching element adapted to control a metering device, the target colour matching element adapted to use the characterisation information of the scattering coloured pigment to determine the volume fraction required to match a target colour, the target colour matching element also being adapted to control the metering device to create a coloured substance that matches the target colour.

21. A pigment characterisation system according to claim 19 or claim 20, in which the system includes a comparator adapted to measure the spectral properties of the coloured substance and compare them with the target colour and, if a match is not detected within predetermined bounds, adjust the concentration of the coloured pigment to obtain a closer match.

22. A pigment characterisation system according to claim 19, in which the system includes a total solar reflectance calculator adapted to calculate the total solar reflectance over at least part of the visible spectrum and infra-red spectrum using the reflectance spectrum.

The invention claimed is:

1. A method of characterising a scattering coloured pigment for use in the determination of the absorption and scattering coefficients of the scattering coloured pigment, the method comprising the step of:

(i) preparing a white paste comprising a mixture of the scattering coloured pigment and a substantially non-absorbing scattering pigment at a plurality of different volume fractions, wherein the scattering coloured pigment is a large particle size pigment having a particle size of greater than 0.6 microns and wherein the substantially non-absorbing scattering pigment is a large particle size titanium dioxide pigment having a particle size greater than 0.6 microns;

(ii) obtaining a reflectance spectrum, using a spectrometer, at least over wavelengths in the visible spectrum and infrared spectrum of the mixture of the scattering coloured pigment with a substantially non-absorbing scattering pigment at a plurality of different volume fractions; and

(iii) obtaining a scattering coefficient of the substantially non-absorbing scattering pigment as a function of volume fraction and wavelength and storing the scattering coefficient in a color model calculator.

2. A method according to claim 1, in which the method includes the step of determining the particle size of the scattering coloured pigment and selecting a non-absorbing scattering pigment having a particle size within 0.5 microns of the particle size of the scattering coloured pigment for performing characterisation therewith provided that the determined particle size is greater than 0.6 microns.

3. A method according to claim 1, in which the scattering coloured pigment is selected from: Complex Inorganic Coloured Pigments; Nickel Antimony Titanate; Chrome Antimony Titanate; Manganese Antimony Titanate; Zinc Iron Chromite Brown Spinel; Chromium Green-Black Hematite; Cobalt Aluminate Blue Spinel; Cobalt Titanate Green Spinel; and Cobalt Chromite Green Spinel.

4. A method according to claim 1, in which the reflectance spectrum of the scattering coloured pigment is determined over a wavelength range of 300 nm to 2500 nm.

5. A method according to claim 1, in which the method includes the steps of:

(iv) obtaining an absorption coefficient of a weakly scattering black pigment as a function of wavelength at a plurality of different volume fractions and storing the absorption coefficient in the color model calculator; and

(v) obtaining a further reflectance spectrum of a mixture of the scattering coloured pigment with the black pigment at a plurality of different volume fractions.

6. A method according to claim 5, in which the weakly scattering black pigment is carbon black.

7. A method according to claim 5, in which the reflectance spectrum and the further reflectance spectrum are obtained using an optically thick layer of the mixture.

8. A method according to claim 5, in which the method includes the step of:

(vi) combining the reflectance spectrum and further reflectance spectrum and calculating the Kubelka Munk absorption and scattering coefficients for the scattering coloured pigment as a function of scattering coloured pigment volume fraction and wavelength and storing the calculated Kubelka Munk absorption and scattering coefficients in the color model calculator.

9. A method according to claim 8, in which the method includes the step of:

(vii) determining the scattering coloured pigment volume fraction required to spectrally match a target reflection spectrum using the coefficients calculated in step (vi).

10. A method according to claim 8, in which the method includes the step of:

(viii) programming a metering apparatus to prepare a formulation in accordance with the volume fraction calculated.

11. A method according to claim 9, in which steps (ii), (v), and (vi) are repeated for different coloured pigments and step (vii) comprises determining the volume fraction of each coloured pigment to match the target colour.

12. A method according to claim 1, in which the reflectance spectra are obtained with a resolution of substantially 10 nm.

13. A method according to claim **8**, in which the method includes the step of calculating the total solar reflectance of the coloured pigment at the volume fraction determined to match the target colour, as a function of film thickness.

14. A method according to claim **13**, in which the method includes the step of calculating the total solar reflectance over at least part of the visible spectrum and infrared spectrum.

15. A method according to claim **14**, in which the method includes the step of calculating the total solar reflectance over the wavelength range 300 to 2500 nm.

16. A pigment characterisation system adapted to perform the method of claim **1** to characterise a scattering coloured pigment.

17. A pigment characterisation system according to claim **16**, in which the system includes a target colour matching element adapted to control a metering device, the target colour matching element adapted to use the characterisation information of the scattering coloured pigment to determine the volume fraction required to match a target colour, the target colour matching element also being adapted to control the metering device to create a coloured substance that matches the target colour.

18. A pigment characterisation system according to claim **16**, in which the system includes a comparator adapted to measure the spectral properties of the coloured substance and compare them with the target colour and, if a match is not detected within predetermined bounds, adjust the concentration of the coloured pigment to obtain a closer match.