Claims

1. A process for producing a treated distillate aromatic extract (TDAE) comprising the following steps:

a) producing a distillate aromatic extract (DAE) Feed by mixing DAE-1, DAE-2 and DAE-3 or using a single type of DAE, or two of the three different types of DAE, to obtain a DAE feed which has a kinematic viscosity at 100°C ranging from 24 to 67 cSt with a density ranging from 0.98 to 1.20 kg/l, wherein the formula of mixing is determined based on the kinematic viscosity at 100°C of each of DAE-1, DAE-2 and DAE-3, respectively, wherein the mixing is carried out in-line or off-line and completed with stirring in a container;

b) mixing the DAE Feed obtained at the step a above with a diluent in an in-line or off-line manner to yield density of Mixture of DAE Feed ranges 0,75 - 0,85 kg/liter, wherein diluent is selected from n-pentane, isopentane, n-hexane, n-heptane, n-octane and isooctane;

c) directing the flow of Mixture of DAE Feed at the step b above to the extractor that has an isothermic temperature, ranges 22°C - 35°C;

d) contacting the flow of Mixture of DAE Feed at the step c above with certain solvents, such as furfural, NMP, and DMSO so that a liquid-liquid extraction process with counter current technique take place at isothermic temperature, ranges 22°C - 35°C,

wherein agitation rotational speed ranges 75 - 100 RPM and ratio of polar solvent to Mixture of DAE Feed ranges 1.7 - 2.0 or from 0.5 to 1.7;

e) adjusting the process of separation of interface layers in the extractor such that give rise to mixture of raffinate and mixture of extract through a control equipment placed at the lower portion of the column;

f) directing the flow of mixture of raffinate obtained in step e. to a solvent recovery unit to separate out the solvent and the diluent from the mixture of raffinate to yield either a product containing polycyclic aromatic (PCA) Less than 3% weight and the sum of eight types of polyaromatic hydrocarbon (8 Grimmers PAH) less than 10 mg/kg and benzo (a)pyrene (BaP) Less than 1 mg/kg (TDAE-1), or a product containing PCA between 3% - 20% weight and 8 Grimmers PAH less than 10 mg/kg; and BaP Less than 1 mg/kg (TDAE-2), wherein TDAE-1 is obtained when applying the ratio of polar solvent to Mixture of DAE Feed of 1.7 to 2.0 in step d. , and TDAE-2 is obtained when applying the ratio of polar solvent to Mixture of DAE Feed of 0.5 to 1.7 in step d.;

g) directing the flow of mixture of extract obtained In step e. to a solvent recovery unit to separate out the solvent from the mixture of extract to yield an end product with high aromatic concentration extract (HACE); and

h) collecting the solvent and diluent separated out in step f. and g., respectively, into a container for reutilization in the next extraction process.

2. The process according to claim 1 wherein the temperature of operation conditions applied in step b ranges 20°C - 70°C, and the ratio of diluents to DAE Feed ranges 0.3-3.0, more preferably at 1.0 so that the density of the resulted Mixture of DAE Feed ranges 0.75-0.85 kg/liter.

~~3. TDAE-1 obtained by a process according to any of claims 1-2, having PCA less than 3% weight and 8 Grimmers PAH less than 10 mg/kg and benzo (a)pyrene (BaP) less than 1 mg/kg and an aromatic content of more than 25% weight calculated based on ASTM D2140.~~

3. The process according to any of the preceding claims, wherein the solvent in step c is the same as the solvent used in the previous extraction to obtain DAE Feed.

4. The process according to any of the preceding claims, wherein the solvent in step c is furfural.

~~4~~5. TDAE-2 o~~0~~btatned by a process according to any of claims 1-~~2~~4 having PCA between ~~8~~3% - 20% weight and 8 Grimmers PAH less than 10 mg/kg and BaP ~~Less~~less than 1 mg/kg and an aromatic content of more than 25% weight calculated based on ASTM D2140.