CLAIMS

Claim 1: A process for producing a hydroprocessed steam cracker tar ("SCT"), the process comprising:

(a) providing an SCT having a temperature $T_1 \leq 350°C$ and a reactivity $R_T \geq 28$ Bromine Number units ("BN"), the SCT having a density at 15°C ≥ 1.10 g/cm^3 and viscosity at 50°C ≥ 1000 cSt, wherein at least 70 wt. % of the SCT has a normal boiling point of at least 290°C;

(b) establishing a predetermined reference reactivity $R_{Ref} \leq 18$ BN;

(c) carrying out either

(i) conducting away at least a portion of the SCT or hydroprocessing at least a portion of the SCT under Mild Hydroprocessing Conditions, or

(ii) producing a treated SCT by carrying out one or more of

(A) one or more thermal treatments of at least a portion of the SCT by heating from T_1 to a temperature T_{HS}, and maintaining the SCT at a temperature of at least T_{HS} for a time t_{HS} of at least 10 minutes to produce a treated SCT, wherein T_{HS} is at least 10°C greater than T_1 and T_{HS} is in the range of 300°C to 360°C and t_{HS} of ≥ 5 minutes, and

(B) combining at least a portion of the SCT with a second SCT; and

following steps (A) and/or (B) determining an R_T of the treated SCT, and comparing R_{Ref} and the R_T of the treated SCT, and

(I) when R_T of the treated SCT exceeds 12 BN, carrying out step (c)(i) or repeating steps (c)(ii)(A) and/or step (c)(ii)(B), or

(II) when R_T of the treated SCT does not exceed R_{Ref}, then conducting the treated SCT to step (d); and

(d) hydroprocessing the treated SCT, the hydroprocessing being carried out under Standard Hydroprocessing Conditions in the presence of (i)

a utility fluid, (ii) at least one catalyst, and (iii) a treatment gas comprising molecular hydrogen to produce a hydroprocessor effluent comprising hydroprocessed SCT, wherein the Standard Hydroprocessing Conditions include a temperature ≥ 200°C, a pressure ≥8 MPa, a weight hourly space velocity ("WHSV", tar basis) ≥ 0.3 hr^{-1} , and a molecular hydrogen consumption rate (tar basis) in the range of from 270 S m^3/m^3 to about 534 S m^3/m^3.

Claim 2: The process of claim 1, wherein (i) R_T and R_{Ref} are determined by a Bromine Number measurement and expressed in BN units, (ii) R_{Ref} is ≤ 10 BN, and (iii) ≥90 wt. % of the SCT has a normal boiling point ≥ 290°C, (iv) the SCT has a viscosity at 15°C ≥ 1×10^4 cSt, and (v) the SCT has a density ≥ 1.1 g/cm^3.

Claim 3: The process of claim 1, wherein the utility fluid comprises two-ring and three-ring aromatics.

Claim 4: The process of claim 1, wherein hydroprocessing of step (d) exhibits a 566°C+ conversion of at least 20 wt. % continuously for at least ten days.

Claim 5: The process of claim 1, wherein hydroprocessed SCT has a density measured at 15°C that is at least 0.12 g/cm^3 less than that of the SCT.

Claim 6: The process of claim 1, wherein the catalyst is a supported hydroprocessing catalyst which includes at least one metal selected from any of Groups 5 to 10 of the Periodic Table.

Claim 7: The process of claim 1, wherein t_{HS} is >2 0 minutes.

Claim 8: The process of claim 1, wherein T_{HS} < 300° C.

Claim 9: The process of claim 1, wherein T_{HS} < 250° C.

Claim 10: The process of claim 1, wherein t_{HS} is < 70 minutes.

Claim 11: The process of claim 1, wherein R_T and R_{Ref} are determined by one or more of electrochemical titration, colorimetric titration, and coulometric Karl Fischer titration.

Claim 12: The process of claim 1 wherein the reactivity R_T of treated SCT conducted to step (d) is $\leq$ 18 BN.