CLAIMS

1. A process comprising:

mixing an isotropic feed and a seeding agent to make a blend and reacting in a reaction zone the blend comprising the isotropic feed and the seeding agent, to produce a reacted pitch having a mesophase content of 10 vol% to 100 vol%, based on the total volume of the reacted pitch, and a softening point (T_{sp}) below 400°C;

wherein the seeding agent is 50 wt% or less, based on the total weight of the blend;

wherein the seeding agent is a mesophase pitch having a mesophase content of 0.60 vol% to 100 vol%, based on the total volume of the seeding agent; and

separating the reacted pitch in a separation zone to produce:

a first effluent comprising a mixture of gaseous products and liquid products; and

a second effluent comprising a separated pitch having a mesophase content of 10 vol% or greater, based on the total volume of the separated pitch, and a softening point T_{sp} below 400°C.

2. The process of claim 1, wherein the seeding agent is a mesophase pitch produced from at least a portion of an isotropic pitch that is the same or different than the isotropic feed.

3. The process of claim 1, wherein the blend has a volume ratio isotropic feed/seeding agent of 50:50 to 99.9:0.1.

4. The process of claim 1, wherein the blend has a seeding agent content of 0.5 wt% to 40 wt%, based on the total weight of the blend.

5. The process of claim 1, wherein reacting the blend is carried out under one or more of: a partial pressure of hydrogen of 10 MPa or less, a temperature in the range of 200°C to 600°C, a pressure in the range of 0.0005 MPa to 25 MPa, a residence time of 0.25 minutes to 24 hours, or a WHSV in the range of 0.1 hr^{-1} to 4 hr^{-1}.

6. The process of claim 1, wherein reacting the blend is selected from the group consisting of: pyrolyzing, slurry hydrocracking, acid-catalyzed reaction, and any combination thereof, wherein acid-catalyzed reaction comprise: hydrotreating and/or acid-catalyzed oligomerization.

7. The process of claim 1, wherein reacting the blend is performed in presence of a hydrogen-donor solvent.

8. The process of claim 1, wherein the reacted pitch has a carbon residue content of from 20 wt% to 99 wt%, based on the total weight of the reacted pitch and/or wherein the reacted pitch has a hydrogen content of from 3 wt% to 12 wt%, a sulfur content of from 0 wt% to 10 wt%, based on the total weight of the reacted pitch.

9. The process of claim 1, wherein the reacted pitch has a T10 in the range of 200°C to 650°C.

10. The process of claim 1, wherein the separated pitch has a mesophase content of 10 vol% to 100 vol%, based on the total volume of the separated pitch.

11. The process of claim 1, wherein the separated pitch has softening point (T_{sp}) of 100°C to 400°C.

12. The process of claim 1, wherein the separated pitch has a carbon residue content of from 20 wt% to 99 wt%, based on the total weight of the separated pitch and/or wherein the separated pitch has a hydrogen content of from 3 wt% to 12 wt%, a sulfur content of from 0 wt% to 10 wt%, based on the total weight of the separated pitch.

13. The process of claim 1, further comprising:

recycling at least a portion of the second effluent back to the reaction zone, wherein the second effluent is used as the seeding agent.

14. The process of claim 1, wherein the separated pitch is combined with a reinforcing agent for the production of a composite.

15. The process of claim 1, wherein the separated pitch is used as a matrix material in the production of a composite.

16. A fiber, a carbon fiber, an oxidized fiber, carbonized fiber, graphitized fiber, fiber web, oxidized fiber web, carbonized fiber web, or graphitized fiber web prepared using the separated pitch of claim 1.

17. The process of claim 1, wherein the separated pitch is spun at a spinning temperature greater than 200°C.

18. A process comprising:

reacting in a reaction zone, in a batch, semi-batch or continuous mode, a blend comprising an isotropic feed and a seeding agent, to produce a reacted pitch having a mesophase content of 10 vol% to 100 vol%, based on the total volume of the reacted pitch, and a softening point T_{sp} below 400°C;

wherein the seeding agent is 50 wt% or less, based on the total weight of the blend;

wherein the seeding agent has a mesophase content of 0.01 vol% to 100 vol%, based on the total volume of the seeding agent;

separating the reacted pitch in a separation zone to produce:

a first effluent comprising a mixture of gaseous products and liquid products; and

a second effluent comprising a separated pitch having a mesophase content of 10 vol% or greater, based on the total volume of the separated pitch, a softening point T_{sp} below 400°C, wherein the reacted pitch and/or the separated pitch are/is suitable for spinning into carbon fiber; and

recycling at least a portion of the second effluent back to the reaction zone, wherein the separated pitch is used as the seeding agent.

19. A carbon fiber produced from a mesophase pitch having a softening point (T_{sp}) below 400°C;

wherein the mesophase pitch is produced in a reaction zone from a reaction blend comprising an isotropic feed and a seeding agent having a mesophase content of 0.01 vol% to 100 vol%, based on the total volume of the seeding agent; and

wherein the reaction blend comprises a seeding agent content of 50 wt% or less, based on the total weight of the blend.

20. A process comprising:

depositing a mesophase pitch onto a sample holder suitable for optical microscopy, wherein the mesophase pitch is produced by reacting in a reaction zone a blend comprising an isotropic feed and 50 wt% or less of a seeding agent, based on the total weight of the blend, wherein the seeding agent has a mesophase content of 0.01 vol% to 100 vol%, based on the total

volume of the seeding agent, to produce the mesophase pitch at a mesophase content of 0.01 vol% to 100 vol%, based on the total volume of the mesophase pitch, and a softening point T_{sp} below 400°C;

heating the sample holder to a temperature above the softening point of the mesophase pitch;

obtaining a 2-dimensional molecular characterization of the mesophase pitch; and

tracking the distributions of single molecules within the mesophase pitch.