7. The method of claim 1, wherein the hydrocarbon compounds comprise derivatives or distillate cuts of oils, tars, or asphaltenes.

8. The method of claim 7, wherein the oil, tars, or asphaltenes comprise petroleum, coal-derived oils, biomass-derived oils, oil sands, oils shale.

9. The method of claim 1, wherein the hydrogen source is selected from the group consisting of hydrogen, methane, natural gas, light hydrocarbons (≤C4), and combinations thereof.

10. The method of claim 1, having a liquid hourly space velocity (LHSV) greater than 0.1 hr−1.

11. The method of claim 1, wherein the reaction zone has a bulk temperature from 120° C. to 450° C.

12. The method of claim 1, wherein said reacting comprises a reaction selected from the group consisting of hydrogenation, hydrocracking, hydrodesulfurization, hydrodenitrogenation, hydrodeoxygenation, hydrodemetalization, and combinations thereof.

13. A method of hydroprocessing a feedstock comprising one or more hydrocarbon compounds carried in or mixed with a transport gas, the method comprising:

flowing the feedstock through a reaction zone in a reactor, the reaction zone having a bulk pressure less than 3 atm;

applying acoustic energy through the reaction zone, the acoustic energy having frequencies and sound pressure levels sufficient to induce non-linear effects; and

chemically reacting the hydrocarbon compounds with a hydrogen source in the presence of a catalyst, said reacting occurring in the reaction zone.

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