[0012] Hydrocracking catalysts are bifunctional: hydrotreating is facilitated by the hydrogenation function provided by the metal components, and the cracking reaction is facilitated by the solid acid components. Both reactions need the presence of high pressure hydrogen.

[0013] During hydrocracking, the heavy hydrocarbon feed molecules form a liquid film and covers the active sites of the catalyst. Due to the limitation of hydrogen solubility in hydrocarbons, the hydrogen availability in the hydrocracking catalyst extrudates has been an issue. In practice, the heavy hydrocarbon feed fills the pores first, and reactant hydrogen must then access the active sites in the pores via diffusion through the heavy hydrocarbon feed. Conventional hydrocracking catalysts exhibit limited hydrogen pore diffusivity with heavy, more refractive feedstocks. This has inhibited the hydrogenation function of the hydrocracking catalysts, which results in middle distillates and unconverted oil (UCO) products with poor quality. This issue becomes more significant when the hydrocracking feed become more disadvantaged, as these feeds consume greater amounts of hydrogen during hydroprocessing, making even less hydrogen available for diffusion into the pores.

[0014] Accordingly, there is a current need for a hydrocracking catalyst that exhibits a higher degree of hydrogen efficiency, and greater product yield and quality, as compared to conventional hydrocracking catalysts.

SUMMARY OF THE INVENTION

[0015] The present invention is directed to an improved finished hydrocracking catalyst containing a HNPV ASA component in combination with a HNPV alumina support. The ASA base is characterized as having a low particle density. The HNPV ASA component employed in the catalyst of the present invention is characterized as having a narrower pore size distribution as compared to a conventional ASA, and the alumina support is characterized as having a broader pore size distribution as compared to an alumina base used in conventional hydrocracking catalysts.

[0015a] The present invention provides a hydrocracking catalyst, comprising:

a base extrudate comprising at least one molecular sieve, an alumina and an amorphous silica alumina support, wherein the base extrudate has a nanopore volume in the 6 nm to 11 nm range of 0.5 to 0.9 cc/g; and

at least one metal selected from the group consisting of elements from Group 6 and Groups 8 through 10 of the Periodic Table.

[0015b] The present invention provides a process for hydrocracking a hydrocarbonaceous feedstock, comprising contacting the feedstock with a hydrocracking catalyst under hydrocracking conditions to produce a hydrocracked effluent;

the hydrocracking catalyst comprising

a base extrudate comprising at least one molecular sieve, an alumina and an amorphous silica alumina support, wherein the base extrudate has a nanopore volume in the 6 nm to 11 nm range of 0.5 to 0.9 cc/g; and

at least one metal selected from the group consisting of elements from Group 6 and Groups 8 through 10 of the Periodic Table.

[0015c] The present invention provides a hydrocracking catalyst, comprising:

a base extrudate comprising at least one molecular sieve, an alumina and an amorphous silica alumina support, wherein the base extrudate has a total nanopore volume in the 2 to 50 nm of 0.7 to 1.2 cc/g; and

at least one metal selected from the group consisting of elements from Group 6 and Groups 8 through 10 of the Periodic Table.

[0015d] The present invention provides a process for hydrocracking a hydrocarbonaceous feedstock, comprising contacting the feedstock with a hydrocracking catalyst under hydrocracking conditions to produce a hydrocracked effluent;

the hydrocracking catalyst comprising

a base extrudate comprising at least one molecular sieve, an alumina and an amorphous silica alumina support, wherein the base extrudate has a total nanopore volume in the 2 to 50 nm of 0.7 to 1.2 cc/g; and

at least one metal selected from the group consisting of elements from Group 6 and Groups 8 through 10 of the Periodic Table.

[0015e] The present invention provides a hydrocracking catalyst, comprising:

a base extrudate comprising at least one molecular sieve, an alumina and an amorphous silica alumina support, the base extrudate having a particle density of 0.7 to 0.9 cc/g; and

at least one metal selected from the group consisting of elements from Group 6 and Groups 8 through 10 of the Periodic Table.

[0015f] The present invention provides a process for hydrocracking a hydrocarbonaceous feedstock, comprising contacting the feedstock with a hydrocracking catalyst under hydrocracking conditions to produce a hydrocracked effluent;

the hydrocracking catalyst comprising

a base extrudate comprising at least one molecular sieve, an alumina and an amorphous silica alumina support, the base extrudate having a particle density of 0.7 to 0.9 cc/g; and

at least one metal selected from the group consisting of elements from Group 6 and Groups 8 through 10 of the Periodic Table.

[0015g] The present invention provides a hydrocracking catalyst, comprising:

a base extrudate comprising at least one molecular sieve, an alumina and an amorphous silica alumina support, wherein the base extrudate is formed using an amorphous silica alumina support having a nanopore volume in the 6 nm to 11 nm range of 0.6 to 0.9 cc/g; and

at least one metal selected from the group consisting of elements from Group 6 and Groups 8 through 10 of the Periodic Table.

[0015h] The present invention provides a process for hydrocracking a hydrocarbonaceous feedstock, comprising contacting the feedstock with a hydrocracking catalyst under hydrocracking conditions to produce a hydrocracked effluent;

the hydrocracking catalyst comprising

a base extrudate comprising at least one molecular sieve, an alumina and an amorphous silica alumina support, wherein the base extrudate is formed using an amorphous silica alumina support having a nanopore volume in the 6 nm to 11 nm range of 0.6 to 0.9 cc/g; and

at least one metal selected from the group consisting of elements from Group 6 and Groups 8 through 10 of the Periodic Table.

[0016] It has been found that by employing ASA and alumina materials having a higher nanopore volume in the 6 to 11 nm range, the base extrudate exhibits a lower particle density. A lower base extrudate particle density allows for increased metals loading while maintaining a conventional particle density for the finished hydrocracking catalyst. The finished hydrocracking catalysts employing using the