fractions, and the processes to remove them tend to reduce the yield of high viscosity products. Heavier petroleum fractions also tend to concentrate aromatics and other low viscosity index molecules; upgrading these fractions to achieve a high viscosity index has the same negative impact on yield of the high viscosity products.

[006] A number of methods have been proposed for producing high quality base oils having a high viscosity. For example, US7776206 describes a distillation method for producing a lubricant bright stock. The goal remains of developing new catalytic processes for producing a high viscosity lubricating base oil at high yields.

SUMMARY OF THE INVENTION

[007] The process of this invention produces a lubricating base oil from a lubricating oil feedstock that is difficult to process using conventional methods. In the process, a lubricating oil feedstock comprising a hydroprocessed feedstream is provided to a hydrocracking reaction zone; and the lubricating oil feedstock is hydrocracked with a hydrogen-containing treat gas stream under hydrocracking conditions to form a hydrocrackate. The lubricating oil feedstock has a nitrogen content of greater than 300 ppm and a sulfur content of greater than 0.1 wt. %. In the hydrocracking reaction zone, at least 10 wt. % of the feedstock is converted to products which boil below the initial boiling point of the feedstock. The hydrocrackate is separated into at least a gaseous product that contains ammonia, and a liquid fraction that boils above the initial boiling point of the feedstock; and has a nitrogen content of less than 50 ppm. In one embodiment, the liquid fraction is dewaxed in the presence of a hydrogen-containing treat gas stream over a shape selective intermediate pore size molecular sieve catalyst at hydroisomerization conditions, to produce a dewaxed effluent having a pour point of less than -5°C. The dewaxed effluent is provided to a hydrofinishing reaction zone for hydrogenating the dewaxed effluent over a hydrofinishing catalyst, to form a heavy lubricating base oil having a viscosity index of greater than 95 and a viscosity at 100°C of 10 cSt or greater.

[007a] In one embodiment, there is provided a process for hydrocracking a lubricating oil feedstock in a single reaction stage comprising a layered catalyst system, which process comprises: blending a straight run feedstock and a hydroprocessed feedstream to form a lubricating oil feedstock having a nitrogen content of greater than 300 ppm and a sulfur

content of greater than 0.1 wt. %; hydrocracking the lubricating oil feedstock with a hydrogen-containing treat gas over a self-supported mixed metal sulfide catalyst under hydrocracking conditions to form a hydrocrackate, wherein at least 10 wt. % of the feedstock is converted to products which boil below the initial boiling point of the feedstock; separating the hydrocrackate into at least a gaseous product that contains ammonia, and a liquid fraction that boils above the initial boiling point of the feedstock and has a nitrogen content of less than 50 ppm; dewaxing the liquid fraction in the presence of a hydrogen-containing treat gas stream over a shape selective intermediate pore size molecular sieve catalyst at hydroisomerization conditions, to produce a dewaxed effluent having a pour point of less than -5°C; and providing the dewaxed effluent to a hydrofinishing reaction zone for hydrogenating the dewaxed effluent over a hydrofinishing catalyst; to form a heavy lubricating base oil having a viscosity index of greater than 95 and a viscosity at 100°C of 10 cSt or greater.

[008] In one embodiment, the hydrocracking reaction zone contains a self-supported mixed metal sulfide catalyst for hydrocracking the lubricating oil feedstock. In one embodiment, the hydrocracking reaction zone contains a hydrotreating catalyst in one catalyst layer upstream of the self-supported mixed metal sulfide catalyst in a second catalyst layer.

[009] In one embodiment, the process provides a method for preparing a lubricating base oil having a viscosity at 100°C of 10 cSt or greater, a VI of at least 100, a pour point of -5°C or below and a nitrogen content of less than 20 ppm. In one embodiment, the process prepares a lubricating base oil which boils in the temperature range from 750° to 1300°F and has a nitrogen content of less than 20 ppm.

[010] In another embodiment, the process provides a hydrocracking process on a heavy VGO blended feedstream yielding a heavy lubricating base oil, which process includes