CLAIMS

What is claimed is:

1. A catalyst comprising:

a bound zeolite support, wherein the bound zeolite support comprises a KL-zeolite bound with silica and a first amount of fluorine;

platinum supported by the zeolite support;

chlorine supported by the zeolite support; and

a second amount of fluorine supported by the zeolite support;

wherein an average crush strength of the catalyst is greater than 12 lb based on at least two samples of pellets of the catalyst measured in accordance with ASTM D4179.

2. The catalyst of claim 1, wherein the bound zeolite support has a weight ratio of the KL-zeolite to the silica binder in a range of from 90:10 to 70:30.

3. The catalyst of claim 1 or claim 2, wherein the zeolite comprises a large pore zeolite with a pore diameter of 0.6 nm to 1.5 nm.

4. The catalyst of any proceeding claim, wherein the bound zeolite support comprises fluoride present in an amount of from 0.1wt.% to 5wt.% based on x-ray florescence.

5. The catalyst of any proceeding claim, wherein each of the at least two samples of pellets has 50 pellets.

6. The catalyst of any proceeding claim, wherein less than 22% of the pellets that are measured in accordance with ASTM D4179 have an individual pellet crush strength of less than 10 lb/pellet.

7. The catalyst of claim 6, wherein less than 21% of the pellets that are measured in accordance with ASTM D4179 have an individual pellet crush strength of less than 10 lb/pellet.

8. The catalyst of any of claims 1 to 5, wherein less than 14% of the pellets that are measured in accordance with ASTM D4179 have an individual pellet crush strength of less than 9 lb/pellet.

9. The catalyst of claim 8, wherein less than 13% of the pellets that are measured in accordance with ASTM D4179 have an individual pellet crush strength of less than 9 lb/pellet.

10. A method of preparing a catalyst according to any proceeding claim, the method comprising:

calcining an extruded base to form a calcined extruded base, wherein the extruded base comprises a KL-zeolite and a silica binder;

contacting the calcined extruded base with a first fluorine-containing compound to form a fluorinated calcined extruded base;

washing the fluorinated calcined extruded base to form a washed fluorinated calcined extruded base;

drying the washed fluorinated calcined extruded base to form a dried washed fluorinated calcined extruded base;

calcining the dried washed fluorinated calcined extruded base to form a bound zeolite support;

contacting the bound zeolite support with a platinum metal and a second fluorine-containing compound,

wherein the first fluorine-containing compound and the second fluorine-containing compound may be the same or different; and

contacting the bound zeolite support with a chlorine-containing compound.

11. The method of claim 10, wherein the bound zeolite support is contacted with the chlorine- containing compound while the bound zeolite support is contacted with the platinum metal and with the second fluorine-containing compound.

12. The method of claim 10 or claim 11, wherein the chlorine-containing compound is an organic ammonium halide compound represented by the general formula $N(R)_4C1$,

where R represents a hydrogen or a substituted or unsubstituted carbon chain molecule having from 1 to 20 carbon atoms and wherein each R may be the same or different.

13 The method of any of claims 10 to 12, wherein the first fluorine-containing compound and the second fluorine-containing compound are independently selected from tetramethylammonium fluoride (TMAF) and ammonium fluoride (NH_4F).

14. The method of any of claims 10 to 13, further comprising:

after contacting the bound zeolite support with the platinum metal and the second fluorine-containing compound, drying and then calcining the bound zeolite support to form the catalyst.

15. The method of any of claims 10 to 14, wherein the first fluorine-containing compound is in the gas phase.