

CLAIMS

What is claimed is:

1. A catalyst comprising: a zeolite support; a Group VIII metal on the zeolite support;
5 and at least two halides bound to the zeolite support, to the Group VIII metal, or to both;
wherein an average crush strength of the catalyst is greater than 11.25 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 each of the at least two samples of pellets has 50
10 pellets.
3. The catalyst of claim 1, wherein the average crush strength is greater than 12 lb based on at least two samples of pellets of the catalyst measured in accordance with ASTM D4179.
- 15 4. The catalyst of claim 1, wherein an average crush strength per length of the catalyst is greater than about 2.48 lb/mm.
5. The catalyst of claim 4, wherein the average crush strength per length of the catalyst is in a range of from about 3.00 lb/mm to about 3.10 lb/mm.
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6. The catalyst of claim 1, 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
25 accordance with ASTM D4179 have an individual pellet crush strength of less than 10 lb/pellet.
8. The catalyst of claim 1, 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.
- 30 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. The catalyst of claim 1, wherein the zeolite support comprises a KL-zeolite.

11. The catalyst of claim 10, wherein the zeolite support further comprises a binder, wherein the binder comprises synthetic or naturally-occurring zeolites, alumina, silica, clays, refractory oxides of metals of Groups IVA and IVB of the Periodic Table of the Elements; oxides of silicon, titanium, zirconium; or combinations thereof.
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12. The catalyst of claim 1, wherein the Group VIII metal is Pt.
13. The catalyst of claim 1, wherein the at least two halides comprise fluoride and chloride.
- 10 14. A method of preparing a catalyst comprising:
calcining an extruded base to form a calcined extruded base, wherein the extruded base comprises a KL-zeolite;
contacting the calcined extruded base with a first fluorine-containing compound to form a fluorinated calcined extruded base;
15 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
20 support; and
contacting the bound zeolite support with a Group VIII 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.
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15. The method of claim 14, further comprising contacting the bound zeolite support with a chlorine-containing compound.
- 30 16. The method of claim 15, wherein the bound zeolite support is contacted with the chlorine-containing compound while the bound zeolite support is contacted with the Group VIII metal and with the second fluorine-containing compound.

17. The method of claim 15, wherein the chlorine-containing compound is an organic ammonium halide compound represented by the general formula $N(R)_4Cl$, 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.

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18. The method of claim 14, wherein the first fluorine-containing compound and the second fluorine-containing compound are independently selected from tetramethylammonium fluoride (TMAF) and ammonium fluoride (NH_4F).

10 19. The method of claim 14, wherein the Group VIII metal is Pt.

20. The method of claim 14, further comprising:

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

15 catalyst.