CLAIMS

1. A method of making a heat generating catalyst for hydrocarbon cracking, the method comprising:

providing at least one mordenite framework-inverted (MFI) zeolite catalyst having a Si/Al molar ratio of 15 or greater;

providing at least one metal oxide precursor, where the metal oxide precursor is a hydrate of a metal salt of nitric acid;

dispersing the at least one metal oxide precursor within a microstructure of the MFI zeolite catalyst, where dispersing the metal oxide precursor within the microstructure of the MFI zeolite catalyst comprises dissolving the metal oxide precursor in water to generate an acidic mixture and adding the acidic mixture drop-wise to the MFI zeolite; and

calcining the heat generating catalyst with the at least one metal oxide precursor dispersed within the microstructure of the MFI zeolite catalyst to form at least one metal oxide in situ,

where the ratio of the MFI zeolite catalyst to the metal oxide is in the range of 70:30 to 85:15 on a weight basis.

2. The method of claim 1 where the at least one metal oxide precursor is dispersed within the microstructure of the MFI zeolite catalyst via at least one of wet impregnation, precipitation, electrolysis deposition, deposition-precipitation, chemical vapor deposition, and flame spray pyrolysis.

3. The method of claim 1 where the at least one metal oxide is at least one of an oxide of iron, copper, zinc, chromium, molybdenum, vanadium, cerium, manganese, bismuth, silver, cobalt, zirconium, tungsten, magnesium, and their combinations.

4. The method of claim 3 where the at least one metal oxide comprises copper oxide.

5. The method of claim 1 where the metal oxide precursor is copper nitrate

trihydrate ($Cu(NO_3)_2.3H_2O$), cobalt (II) nitrate hexahydrate ($Co(NO_3)_2.6H_2O$), or chromium (III) nitrate nonahydrate ($Cr(NO_3)_3.9H_2O$).

6. The method of claim 1 where the at least one metal oxide is chemically bonded to the microstructure of the MFI zeolite catalyst.

7. The method of claim 1 where the MFI zeolite catalyst is crushed ZSM-5 catalyst having an average particle size of 5 to 850 nanometers.

8. The method of claim 7 where the ZSM-5 catalyst is an H-ZSM-5 catalyst.

9. The method of claim 1 where calcining the heat generating catalyst is done in air at 400° C. to 800° C. for sufficient time to convert the metal oxide precursor to a metal oxide in situ.

10. The method of claim 1 where the heat generating catalyst further comprises a promoter.

11. The method of claim 10 where the promoter is at least one of an alkali metal, an alkaline earth metal, a rare earth metal, a transition metal, phosphorous, and their combinations.