CLAIMS

1. A method of making BTX compounds comprising benzene, toluene, and xylene, the method comprising:

feeding a heavy reformate stream to a reactor, the reactor comprising a composite zeolite catalyst,

where the composite zeolite catalyst comprises a mixture of a desilicated mesoporous mordenite and ZSM-5, and

the desilicated mesoporous mordenite, the ZSM-5, or both, comprise one or more impregnated metals; and

producing the BTX compounds by simultaneously performing a transalkylation reaction and a dealkylation reaction of the heavy reformate stream in the reactor, where the composite zeolite catalyst is able to catalyze the transalkylation reaction and the dealkylation reaction simultaneously.

2. The method of claim 1, where the heavy reformate stream comprises at least 15 weight percent (wt.%) methylethylbenzene (MEB) and at least 50 wt.% trimethylbenzene (TMB), based on the total weight of the heavy reformate stream.

3. The method of claim 1, where the one or more impregnated metals are selected from Group VI and Group VII according to IUPAC nomenclature, in which the metal in the zeolite catalyst is from 0.05 to 10 wt.%, based on the total weight of the zeolite catalyst.

4. The method of claim 1, where the composite zeolite catalyst has a weight ratio of ZSM-5 to desilicated mesoporous mordenite of from greater than 0 to 1.0.

5. The method of claim 1, where the composite zeolite catalyst comprises a mixture of desilicated mesoporous mordenite and ZSM-5 in a 60:40 to 80:20 weight ratio.

6. The method of claim 1, where the one or more impregnated metals are selected from the group consisting of molybdenum, chromium, nickel, tungsten, palladium, ruthenium, gold, rhenium, rhodium, or combinations thereof and their respective oxides.

7. The method of any of claims 1 to 6, where the desilicated mesoporous mordenite, the ZSM-5, or both the desilicated mesoporous mordenite and ZSM-5 comprise 0.05 wt.% to 10 wt.% of the one or more impregnated metals.

8. The method of any of claims 1 to 6, where the one or more impregnated metals comprise rhenium (Re).

9. The method of claim 8, where the desilicated mesoporous mordenite comprises from 0.25 to 0.55 wt.% Re.

10. The method of claim 8, where the ZSM-5 comprises from 0.25 to 0.55 wt.% Re.

11. The method of any of claims 1 to 6, where the desilicated mesoporous mordenite has a molar Si to Al ratio of at least 5, as measured by Inductive Coupling Plasma Mass Spectrometry (ICP-MS).

12. The method of any of claims 1 to 6, where the ZSM-5 has a Si to Al molar ratio of at least 10, as measured by ICP-MS.

13. The method of any of claims 1 to 6, where the desilicated mesoporous mordenite has a micropore to mesopore volumetric ratio of less than 3.0.

14. The method of any of claims 1 to 6, where the heavy reformate stream comprises from 15 to 30 wt.% MEB and from 55 to 70 wt.% TMB.

15. The method of any of claims 1 to 6, where the desilicated mesoporous mordenite has a Brunauer-Emmet-Teller (BET) surface area of at least 420 square meters per gram (m^2/g), an external surface area of at least 80 m^2/g, or both.