CLAIMS

1. A catalyst for converting hydrocarbons, the catalyst comprising:

oxidized iron, oxidized cobalt, and oxidized copper; and

a mesoporous support material comprising pores having an average pore diameter of from 2 nm to 50 nm, wherein the support material comprises at least 95 wt.% of alumina.

2. The catalyst of claim 1, where the weight ratio of iron atoms : cobalt atoms : copper atoms in the catalyst is 1 : 0.4 – 0.6 : 0.5 – 0.7.

3. The catalyst of claims 1 or 2, where the mesoporous support material comprises alumina material and silica material.

4. The catalyst of any of claims 1-3, where the mesoporous support material comprises a hierarchical structured material comprising a silicate or aluminosilicate.

5. The catalyst of any of claims 1-4, where the mesoporous support material comprises an activated carbon.

6. The catalyst of any of claims 1-5, where the combined weight of iron atoms, cobalt atoms, and copper atoms in the catalyst is from 0.1 % to 20 % of total weight of the catalyst.

7. The catalyst of any of claims 1-6, where the mesoporous support comprises gamma alumina.

8. A method of making a catalyst, the method comprising:

contacting an iron precursor, a copper precursor, and a cobalt precursor with a mesoporous support material to form an impregnated support material, the mesoporous support material comprising pores having an average pore diameter of from 2 nm to 50 nm; and

calcining the impregnated support material to form the catalyst, where the catalyst comprises catalytic oxidized metal materials comprising oxidized iron, oxidized cobalt, and oxidized copper.

9. The method of claim 8, further comprising drying the impregnated support material under vacuum at a temperature of from 80 °C to 150 °C.

10. The method of claims 8 or 9, where the calcining of the impregnated support material comprises heating the impregnated support material at a temperature greater than 450 °C.

11. The method of any of claims 8-10, further comprising mixing the iron precursor, the copper precursor, and the cobalt precursor with a solvent to form a impregnation solution, and where the impregnation solution contacts the mesoporous support material.

12. The method of claim 11, further comprising agitating the impregnation solution prior to the contacting of the impregnation solution with the mesoporous support material.

13. The method of any of claims 8-12, further comprising evacuating the mesoporous support material prior to the mesoporous support material being contacted with the iron precursor, the copper precursor, and the cobalt precursor.

14. The method of any of claims 8-13, further comprising agitating the impregnated support material at a temperature of from 40 °C to 80 °C.

15. The method of any of claims 8-14, where at least 95 wt.% of the mesoporous support material comprises alumina.