CLAIMS

1. A process for alkylating an aromatic hydrocarbon reactant with an alkylating reagent comprising methanol to produce an alkylated aromatic product, comprising:

introducing the aromatic hydrocarbon and the alkylating reagent into a reactor to produce the alkylated aromatic product, wherein the reactor has an inner refractory lining having an iron content between 0.0001 wt% to 0.5 wt% iron; and

recovering the alkylate aromatic product from the reactor, wherein the alkylated aromatic product comprises xylene.

2. The process of claim 1, wherein the aromatic hydrocarbon reactant comprises toluene.

3. The process of claim 1, wherein the aromatic hydrocarbon reactant comprises benzene.

4. The process of claim 1, wherein the reactor operates at a temperature of 500°C to 700°C.

5. The process of claim 1, wherein the reactor operates at a pressure of 200 kPa to 1,000 kPa.

6. The process of any one of claims 1 to 5, wherein an entire inside lining of the reactor is coated with the inner refractory lining.

7. The process of any one of claims 1 to 5, wherein the iron content of the inner refractory lining is between 0.0001 wt% to 0.15 wt% iron.

8. The process of any one of claims 1 to 5, further comprising adding water to the reactor.

9. An apparatus for alkylating an aromatic hydrocarbon reactant with an alkylating reagent comprising methanol to produce an alkylated aromatic product, comprising:

a first line comprising the aromatic hydrocarbon in upstream communication with a reactor having an inner refractory lining having an iron content between 0.0001 wt% to 0.5 wt% iron; and

a second line in downstream communication with the reactor comprising the alkylate aromatic product, produced by reaction of the aromatic reactant and the alkylating reagent, from the reactor.