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 ~~having~~ an inner refractory lining having ~~a low~~an iron content between 0.0001 wt% to 0.5 wt% iron; and

recovering the alkylate aromatic product ~~, produced by reaction of the aromatic reactant and the alkylating reagent,~~ from the reactor, wherein the alkylated aromatic product comprises xylene.

2. The process of claim 1, wherein the aromatic hydrocarbon reactant ~~includes~~ comprises toluene~~, the alkylating reagent includes methanol, and the alkylated aromatic product includes xylene~~.

3. The process of claim 1, wherein the aromatic hydrocarbon reactant ~~includes~~ comprises benzene~~, the alkylating reagent includes methanol, and the alkylated aromatic product includes xylene~~.

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 ~~1 barg to 10 barg~~200 kPa to 1,000 kPa.

6. The process of any one of claims 1 to 5, wherein ~~the~~ 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 refractory comprises a low iron content between 0.0001 wt% to 0.5 wt% iron.~~

7~~8~~. The process of any one of claims 1 to 5, wherein the ~~refractory comprises a low~~ iron content of the inner refractory lining is between 0.0001 wt% to 0.15 wt% iron.

9~~8~~. The process of any one of claims 1 to 5, further comprising adding water to the reactor.

10~~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.