CLAIMS

1. A method for forming light olefins, the method comprising:

reacting a feed stream in the presence of a catalyst in a reactor to form a product stream and a deactivated catalyst comprising coke;

separating at least a portion of the product stream from the deactivated catalyst;

passing the deactivated catalyst to an oxidation vessel and contacting the deactivated catalyst with a first oxygen-containing gas to remove at least a portion of the coke on the deactivated catalyst to produce a decoked catalyst;

passing the decoked catalyst to a combustor and combusting a supplemental fuel in the combustor to heat the decoked catalyst and produce a heated catalyst;

passing the heated catalyst to an oxygen soak zone and contacting the heated catalyst with a second oxygen-containing gas to produce a reactivated catalyst; and

passing the reactivated catalyst to the reactor.

2. The method of any preceding claim, wherein the deactivated catalyst comprises from 0.01 wt.% to 0.4 wt.% coke when entering the oxidation vessel.

3. The method of any preceding claim, wherein from 0 wt.% to 30 wt.% of coke is present in the decoked catalyst.

4. The method of any preceding claim, wherein at least 70 wt.% of the coke on the deactivated catalyst is combusted in the oxidation vessel.

5. The method of any preceding claim, wherein the first oxygen-containing gas is air.

6. The method of any preceding claim, wherein the oxidation vessel operates with a superficial gas velocity of less than 8 ft/s and the deactivated catalyst in the oxidation vessel has a catalyst bed density of from 20 lb/ft^3 to 60 lb/ft^3.

7. The method of any preceding claim, wherein the combustor operates with a superficial gas velocity of less than 4 ft/s when combusting the supplemental fuel and the decoked catalyst in the combustor has a catalyst bed density of from 20 lb/ft^3 to 40 lb/ft^3.

8. The method of any preceding claim, wherein combusting the supplemental fuel in the combustor increases the temperature of the decoked catalyst to greater than or equal to 660 °C.

9. The method of any preceding claim, wherein the temperature of the heated catalyst is greater than or equal to 660 °C while the heated catalyst is in the oxygen soak zone.

10. The method of any preceding claim, further comprising contacting the reactivated catalyst with a stripping gas before passing the reactivated catalyst to the reactor.

11. The method of any preceding claim, wherein the oxidation vessel is a fluidized bed reactor.

12. The method of claim 1, wherein the oxidation vessel is a fluidized pipe.

13. The method of claim 1, wherein the oxidation vessel is physically isolated from the combustor.

14. The method of any preceding claim, further comprising passing a recycled portion of the heated catalyst directly to the oxidation vessel.

15. The method of any preceding claim, further comprising passing a recycled portion of the heated catalyst directly to the combustor.