

## Supporting Information Available

The CREC riser simulator consists of two sections: the upper and lower shells. The lower shell includes both the injection port and catalyst basket. The catalyst basket is designed to fit inside the annular space of the bottom shell. Each of the shells has its own set of heaters. An impeller is located in the upper section and upon rotation of the impeller at high speed (up to 5000 rpm), the gas is forced both outward in the impeller section and downwards in the outer reactor annulus, causing the solids catalyst to become fully fluidized.

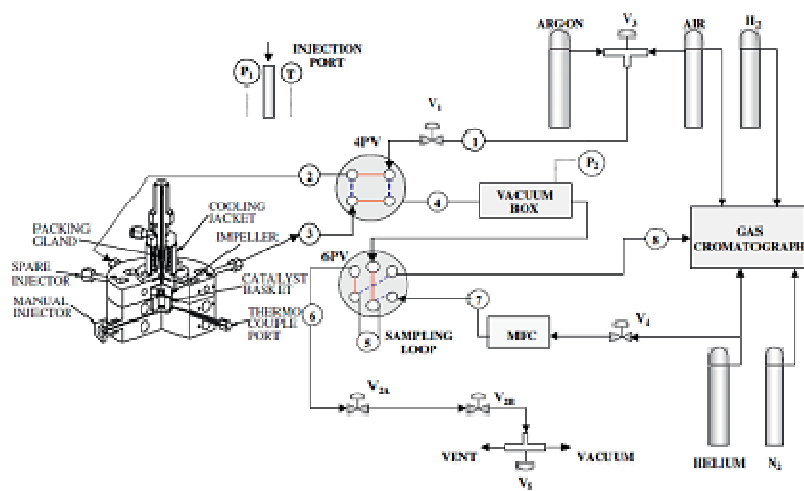


Figure S-1. Schematic diagram of the CREC Riser Simulator experimental setup<sup>39</sup>.

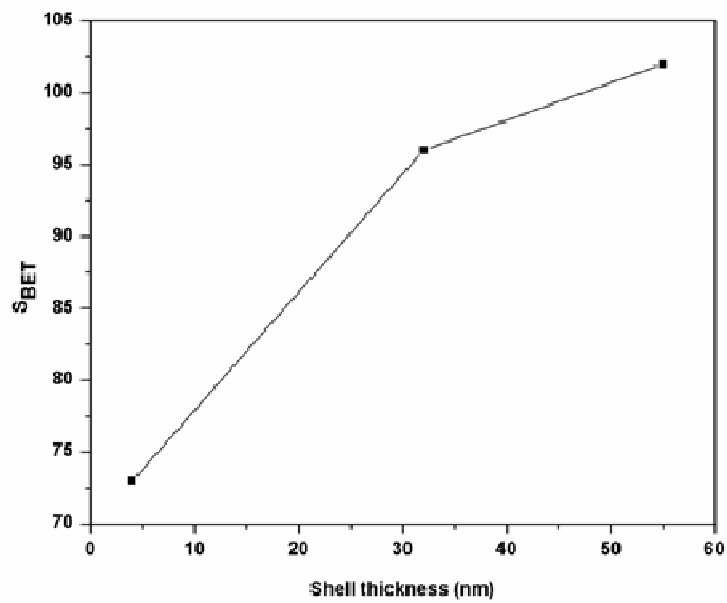


Figure S-2. The dependence of  $S_{BET}$  on mesoporous silica shell thickness in  $\text{LaMn}_{0.7}\text{Fe}_{0.3}\text{O}_{3.15}@\text{mSiO}_2$  oxygen carriers.