Scalable Resistively Heated Reactor for Steam-Methane Reforming

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Eliminating fired furnaces required for endothermic processes eliminates a large fraction of the dilute CO_2 emitted. Based on results and experience with lab-scale reactors, we realize (in the framework of the EU funded project EReTech) the commercial upscaling of a new generation of resistively heated reactors for electrified steam-methane reforming (e-SMR). The scaled-up reactor has a power input of 250 kW, producing up to 400 kg H_2/day. Our contribution will focus on the key requirements for successful scaleup (SYPOX technology), including the core geometry, i.e., positioning of heating elements and catalysts, aspect ratio of the reactor as well as designs to feed the required electrical power. The dependence of key performance indicators, such as the approach to equilibrium will serve to critically highlight the possibilities and limitations of the design. The operating conditions needed to achieve optimum performance will be discussed. Benchmark data generated during operation of this reactor will be used to critically compare electrified reformers and conventional fired reactor designs.