

Sulfur Trioxide Decomposition using the Fe Catalysts in IS Cycle for the Thermochemical Hydrogen Production

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Iodine-Sulfur (IS) thermochemical process has been focused as a hydrogen production process. IS process is the continuous and closed cycle system consisting of three chemical step reactions: i) Bunsen reaction ($I_2 + SO_2 + 2H_2O = 2HI + H_2SO_4$; 293-373 K), ii) HI decomposition ($2HI = H_2 + I_2$; 473-973 K), iii) H_2SO_4 decomposition ($H_2SO_4 = H_2O + SO_3 \rightarrow H_2SO_4 = H_2O + SO_2 + 0.5O_2$; 1073-1173K).

Among the step reactions, SO_3 decomposition is a catalytic reaction to convert SO_3 into SO_2 and O_2 using the heat from VHTR (very high temperature gas-cooled reactor) in IS (Iodine-Sulfur) cycle. In this work, we prepared Fe supported on Al_2O_3 catalyst in this reaction. The molar ratio of Fe catalysts to Al_2O_3 was 0.25, 0.5, 0.75, 1.0. Catalytic reaction was performed in the temperature range of 750-950°C changing the partial pressure and GHSV of the SO_3 in a fixed bed reactor.