

Characterization of nanoporous Fe-Si_xAl_{1-x}O_y particles for hydrogen generation from the thermochemical water splitting

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The nanoporous Fe-Si_xAl_{1-x}O_y particles were synthesized using ultrasonic spray method and characterized by XRD, TEM, SEM and TGA. The synthesized particles were found to be spherical and poly-disperse with an average size of 1 μm and had a high thermal stability at high temperature.

The catalytic performance of samples was evaluated by hydrogen generation using water splitting. Fe²⁺ in the Si_xAl_{1-x}O_y particles was produced by releasing oxygen molecules in the first step. And then Fe²⁺ in the Si_xAl_{1-x}O_y particles generated hydrogen by steam splitting to reproduce Fe₃O₄ in the second step. Finally, the regenerated Fe₃O₄ was sent back to the first step. To prevent sintering and consequently loss in activity, the Si_xAl_{1-x}O_y was used as a thermal stabilizer.

Morphology and catalytic performance of synthesized samples showed no change during repeated four cycling reaction, which showed that Si_xAl_{1-x}O_y was the good stabilizer.