

Enhanced performance for DRM over encapsulated structure catalyst with high dispersion of Ni in silicalite-2 shell

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Abstract

Novel structure catalyst with Ni nanoparticles highly dispersed in silicalite-2 zeolite (S2) was designed and synthesized via a micro-emulsion method followed by solvent-free crystallization route for dry reforming of methane (DRM). Compared with Ni-SiO₂ catalyst without crystallization step, Ni/S2 by impregnation method and Ni@S2 prepared by directly crystallization (Ni@S2-O), the Ni@S2-two steps (Ni@S2-T) catalyst exhibited optimal catalytic activity and stability. No activity loss was observed during 70 h at high GHSV of 240000 mL g⁻¹h⁻¹. Meanwhile, Over spent Ni@S2-T catalyst, hardly any coke was found after the prolonged test, which indicated the remarkable anti-coking ability of Ni@S2-T. Thanks to the unique two-step synthetic processes, the confinement effect of the silicalite-2 shell and stronger metal-support interaction causing by the formation of Ni phyllosilicate were regarded as the main reasons for superb catalytic performances.

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