

Nickel-based nanoparticles as coke-resistant catalyst for dry reforming of methane

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Dry reforming of methane (DRM) is an alternative to steam reforming that uses carbon dioxide as an oxidizing agent to produce hydrogen to withstand the climate crisis. Nickel-based catalysts are the best candidates for DRM because of their high activity and low cost. However, the Ni catalyst has a chronic deactivation problem due to sintering and coke precipitation under high temperature conditions. The core@shell approach, which encapsulates the original nanocatalyst, greatly alleviates the problem. Here, we introduce two strategies for the coke-free characteristics of nickel catalysts. One is nanocatalytic coating by metal oxide via atomic layer deposition (ALD). The other is to synthesize core@shell nanoparticles by encapsulating nickel nanoparticles before impregnation into the support. Both strategies offer a practical way to improve the stability of catalysts to coke deposition.