Interplay between promoters and Ni-based mesoporous silica for methane dry 2 reforming reaction

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Abstract:

Commercially viable Ni-based heterogeneous catalysts have immense potential for the application in reforming reactions, but their rapid catalyst deactivation due to coking still remains a major challenge during these catalytic reforming applications. Herein, the endurance test of 72 h for methane dry reforming at low temperature and atmospheric conditions wasconducted over a series of different promoted Ni-based catalysts. Intriguingly, bare SBA-15supported Ni catalyst blocked the reactor after 51 time-on-stream due to excess carbon formation during the reaction. In addition, the catalyst promoted with yttrium showed the outstanding catalytic performance with CH4 and CO2 conversion of about 83.0% and 90.9%, respectively. On the other hand, boron promoted catalysts greatly improved the Ni and SBA-15 support interaction by facilitating the formation of NiSO3 and detected lowest coke formation and catalytic activity among counterparts. Moreover, different carbon species (herringbone fibers, amorphous and carbon shell) were identified in the spent catalysts.

Keywords: Syngas; Methane dry reforming; catalysts deactivation; Boron promoter; Ni catalyst.