Development of nanosilica-based catalyst for syngas production via CO_2 reforming of CH_4: a review

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ABSTRACT

The alarming global warming issue has sparked interest in researchers to mitigate greenhouse gas emissions via CO_2 reforming of CH_4 (CRM). Regrettably, the main drawback of CRM is catalyst deactivation because of coking and metal sintering. Therefore, exceptional resistance towards coking and sintering is crucial to formulate viable CRM catalysts. This article reviewed the latest development of nanosilica-based catalysts (mesoporous nanosilica, dendritic fibrous nanosilica, green nanosilica, and core@shell nanosilica) for CRM application. The physicochemical properties of nanosilica supports could be modulated by synthesis methods to improve their resistance towards coking and sintering. Furthermore, this review compiled the influence of catalytic properties of nanosilica supported catalysts, such as active metal dispersion, crystallite size, acid-basic properties, oxygen mobility, reducibility, porosity, and morphology on CRM. To conclude, nanosilica supports with strong metal-support interaction, homogeneous metal dispersion, appropriate crystallite size, and moderate acidity/basicity, exhibited satisfactory catalytic activity, thermal stability, and resistance towards coking and sintering. The fundamental study and depth understanding on this catalysis field is of worth in configuring robust catalysts for future industrial applications success of CRM reaction with superb activity and carbon resistance for CRM.

KEYWORDS

CO_2 reforming of CH_4; Nanosilica supports; Catalytic properties; Coking; Sintering

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