

Ru catalyst with promoted zirconia : Enhanced activity and durability in dry reforming of methane

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Global warming is one of the most important problems to be solved. Dry reforming of methane (DRM) is an eco-friendly process to convert two greenhouse gases into valuable gases. So, dry reforming of methane (DRM) has received a remarkable attention. However, the formation of carbon deposition at surface of catalyst is the most serious problem in dry reforming reaction. Noble metals have been known to be active without severe coke formation. We report that small amount of Ru (0.13wt%) is used for synthesis of the catalyst with zirconia and silica. The catalyst shows high activity and durability for dry reforming reaction in 800 °C. Without zirconia, when Ru is deposited on silica, the size of Ru was 6.3 nm. However, with zirconia, the size of Ru was decreased as much as 1.4 nm due to strong metal support interaction(SMSI) between Ru and ZrO<sub>2</sub>. We confirmed the strong metal support interaction (SMSI) by TPR and XANES measurement. The carbon deposition was confirmed after dry reforming reaction in Co-Ru/ZrO<sub>2</sub>-SiO<sub>2</sub> catalyst. However, in Ru/ZrO<sub>2</sub>-SiO<sub>2</sub> catalyst, there is no carbon deposition. It shows stable activity during the reaction at 800 °C.