Effect of Controlled Surface Morphology of $Al@Al_2O_3$ support on Noble Metal Catalysts for the CO_2 methanation reaction

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In order to increase the performance of heterogeneous catalysts, many studies have been conducted on the interaction of active metal-support. The $Al@Al_2O_3$ core-shell microstructure was synthesized by hydrothermal reaction of Al metal powder and calcination. In this process, when NH_4Cl and $MgCl_2$ were added, 2D nanoplates and 1D nanorods of Al2O3 were manufactured by the interaction of ions and aluminum hydrates, respectively, unlike the 3D nano-cuboid shape synthesized with only distilled water. Since the controlled structure exhibits different acid properties depending on the exposed crystal plane, it exhibits different interactions with the active metal phase. 1wt% Ru and Rh noble metal phases, used in the CO_2 methanation ($CO_2 + 4\ H_2 \rightarrow CH_4 + H_2O$) reaction, impregnated on the $Al@Al_2O_3$ microstructures, and compared the metal-support interaction by identifying the CO_2 conversion and selectivity.