

## Article

## Supplementary Materials

# Improving the Stability of Ru-doped Ni-Based Catalysts for Steam-Methane Reforming during daily startup and shutdown operation

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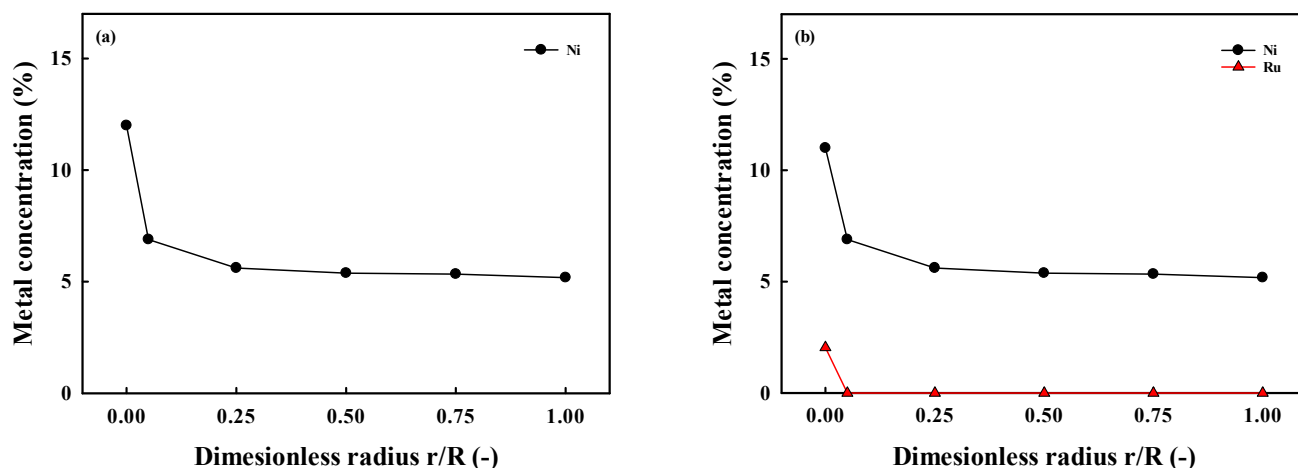


Figure S1. Metal concentration profile measured in prepared catalysts by SEM-EDS: (a) Ni/Al<sub>2</sub>O<sub>3</sub> and (b) Ru-Ni/Al<sub>2</sub>O<sub>3</sub> catalysts

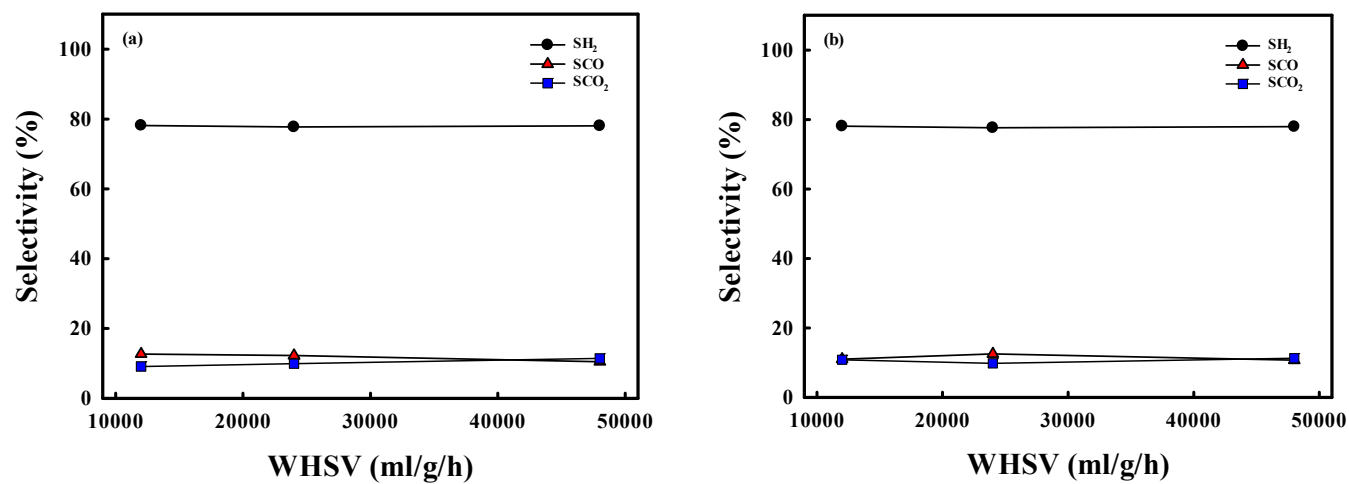


Figure S2. Selectivity of catalysts for SMR reaction at various WHSV: (a)  $\text{Ni}/\text{Al}_2\text{O}_3$  and (b)  $\text{Ru-Ni}/\text{Al}_2\text{O}_3$  catalysts

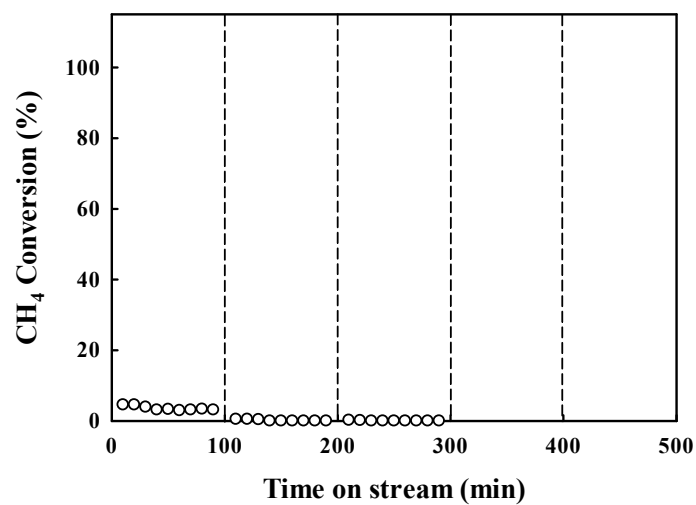


Figure S3.  $\text{CH}_4$  conversion of  $\text{Ru}/\text{Al}_2\text{O}_3$  catalysts for SMR reaction during DSS operation

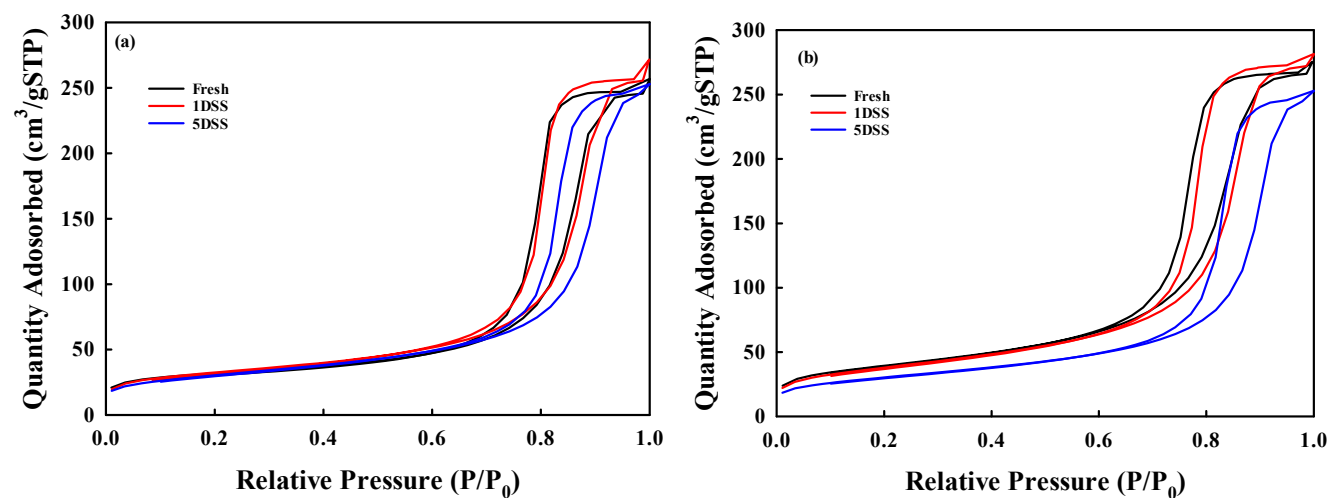


Figure S4. The  $N_2$  adsorption-desorption isotherms of catalysts: (a) Ni/Al<sub>2</sub>O<sub>3</sub> and (b) Ru-Ni/Al<sub>2</sub>O<sub>3</sub> catalysts

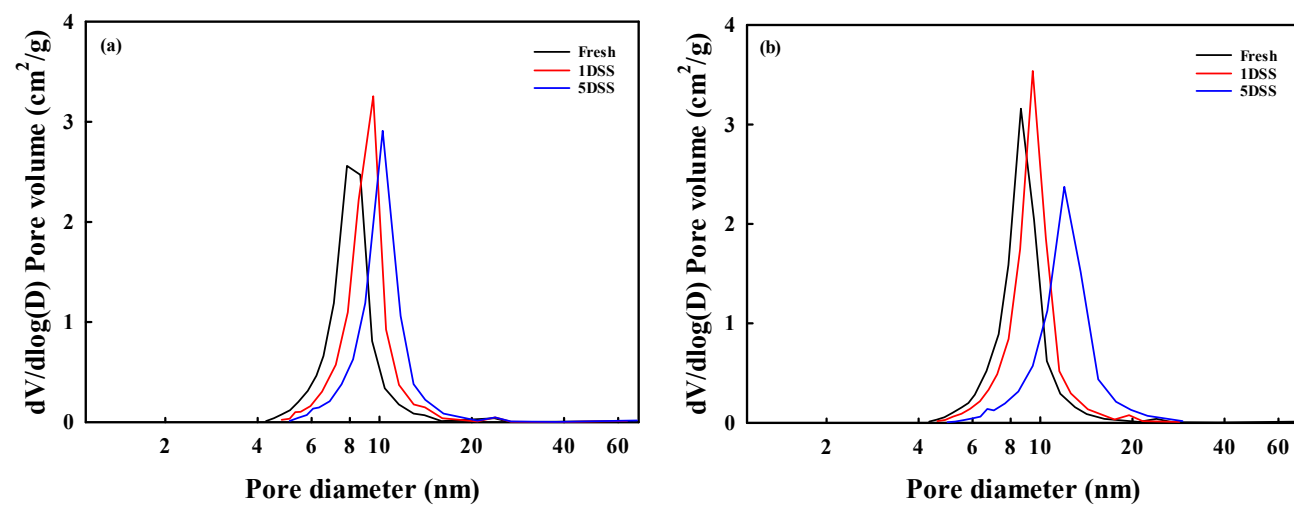


Figure S5. The pore size distributions of catalysts: (a) Ni/Al<sub>2</sub>O<sub>3</sub> and (b) Ru-Ni/Al<sub>2</sub>O<sub>3</sub> catalysts

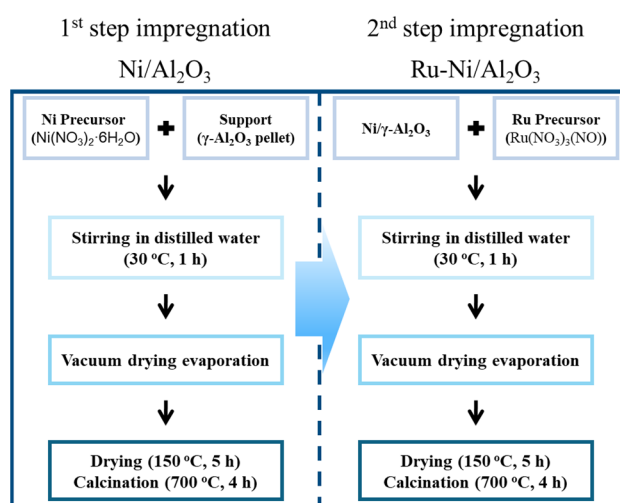


Figure S6. The scheme of the preparation of catalysts by the impregnation method.