Supporting Information

Promotion Effect of H_2S with High Concentration on Catalytic Dry Reforming of Methane in Sour Natural Gas

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Caption of Figure

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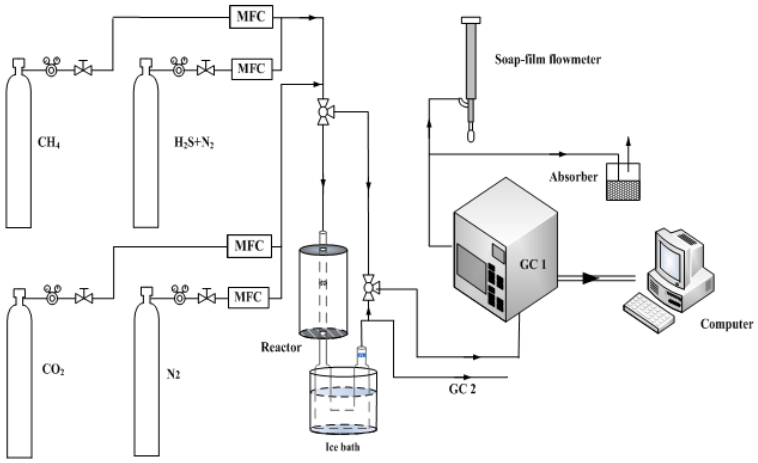

Fig. S1. Flow chart of the apparatus for reaction test.

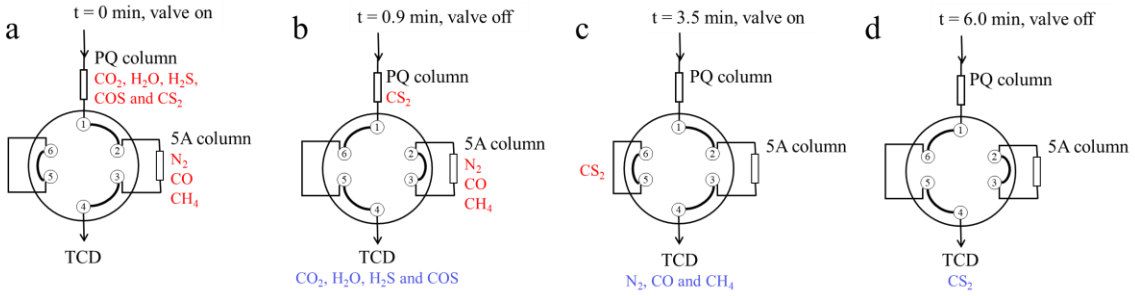

Fig. S2. Schematic diagram illustrating different components flowing through two GC columns separately and the corresponding switching time of six-way sampling valve.

(The detailed sampling analysis process is as follows. As shown in (a), at t=0 min, the valve is switched on. All the components in the flowing gas firstly enter the PQ column. Since the residence time of N_2, CH_4, CO is much shorter than that of CO_2, H_2O, H_2S, COS and CS_2 in the column, N_2, CH_4, CO can flow into the 5A column along the ways of ① and ② of the sampling valve, while CO_2, H_2O, H_2S, COS and CS_2 still rest in the PQ column. (b), at t=0.9 min, the valve is switched off. In the case, N_2, CH_4, CO are closed in the 5A column. CO_2, H_2O, H_2S, and COS flow out from the PQ column and pass along the ways of ①, ⑥, ⑤ and ④ of the sampling valve to TCD, but CS_2 is still in the PQ column. (c), at t=3.5 min, the valve is switched on. N_2, CH_4, CO flow out from the 5A column, entering into TCD along the ways of ③ and ④ of the sampling valve. (d), at t=6.0 min, the valve is switched off. The CS_2 sealed off between the ways of ⑥ and ⑤ can at last pass through the ways of ⑤ and ④ of the sampling valve to TCD. Thus, all the components have arrived at the TCD and are detected. The chromatographic peak sequence diagram of different components including CO_2, H_2O, H_2S, COS, N_2, CH_4, CO, CS_2 and even O_2 (when added) is displayed in the following Fig. S3.)

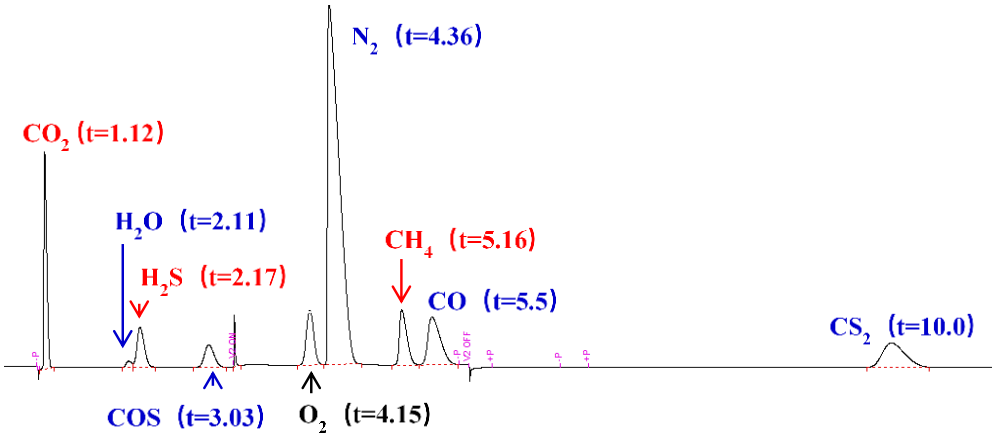

Fig. S3. Chromatographic peak sequence diagram of different components including CO_2, H_2O, H_2S, COS, N_2, CH_4, CO, CS_2 and even O_2 (when added).

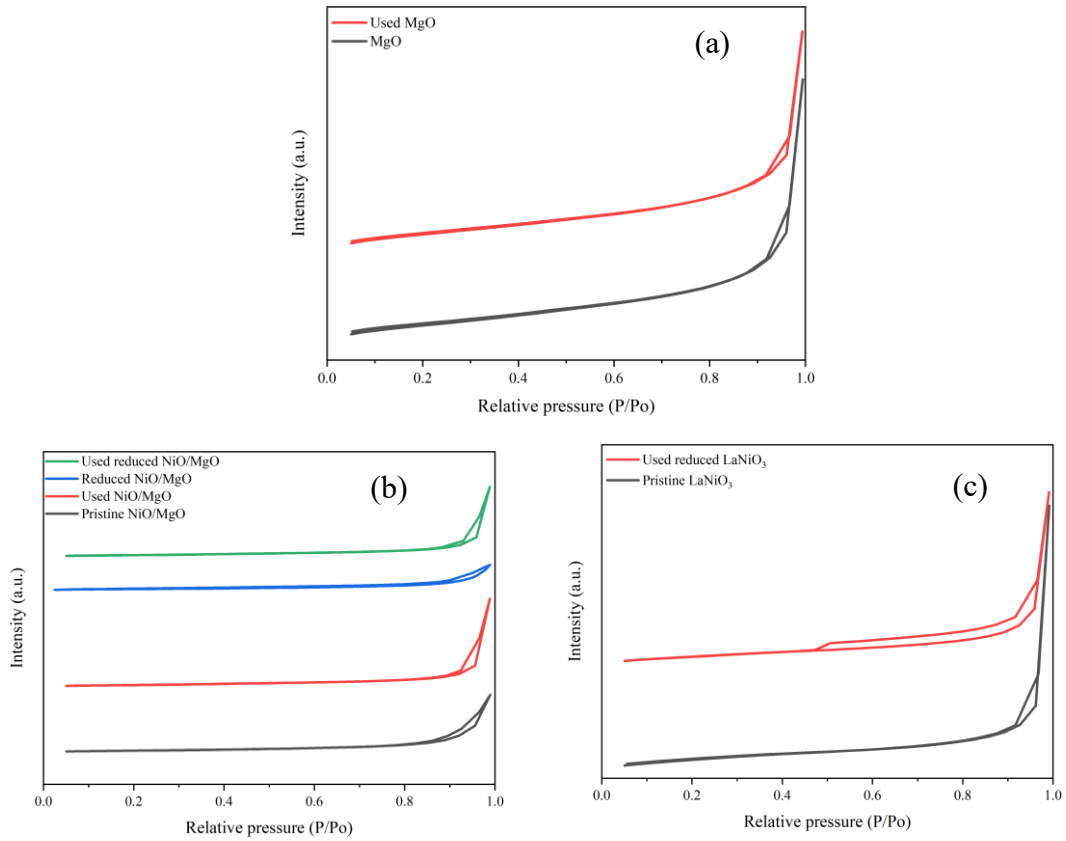

Fig. S4. N_2 physical adsorption-desorption isotherms of various catalysts used in different states before and after the reactions. (a) MgO, (b) NiO/MgO, and (c) $LaNiO_3$

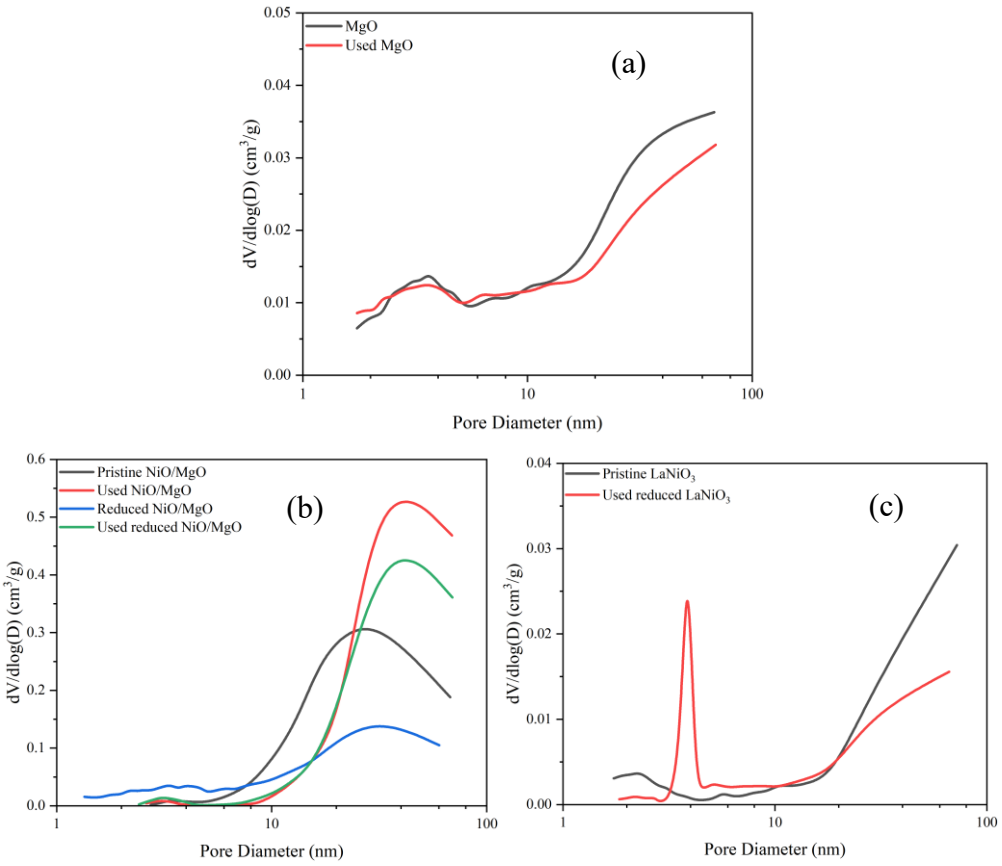

Fig. S5. Pore size distribution profiles of various catalysts used in different states before and after the reactions. (a) MgO, (b) NiO/MgO, and (c) $LaNiO_3$

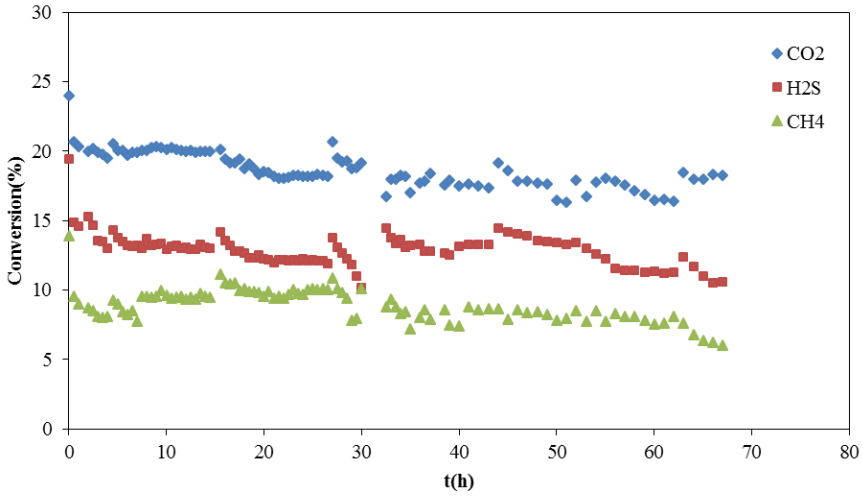

Fig. S6. Stability test of reduced NiO/MgO catalyst for CH_4-CO_2-H_2S reactions at 700 ºC.