Supplementary Information

Atomic layer deposition of nano-scale molybdenum sulfide within a metal-organic framework for highly efficient hydrodesulfurization

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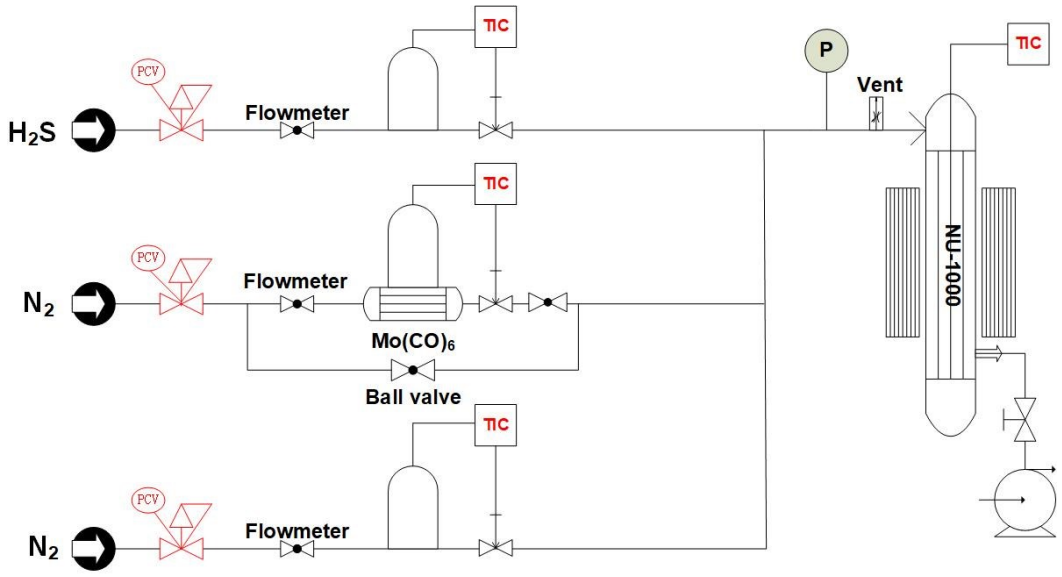

Figure S1. Schematic diagram of the ALD instrument.

Note: ALD runs followed a t_1-t_2-t_3-t_4 timing sequence, where t_1 is the $Mo(CO)_6$ pulse time, t_2 is the N_2 purge time, t_3 is the H_2S pulse time, and t_4 is the N_2 purge time. The pulse times of $Mo(CO)_6$ and H_2S were 120 s and 5 s respectively, and the subsequent tests were conducted in the chronological order of 120-600-5-600 s. And it adopts the temperature setting T_1, T_2 and T_3, where T_1 is the temperature at which $Mo(CO)_6$ is heated to generate the vapors, T_2 is pipeline temperature, and T_3 is the deposition chamber temperature. T_1, T_2 and T_3 were kept fixed at 55, 90 and 170 °C, respectively.

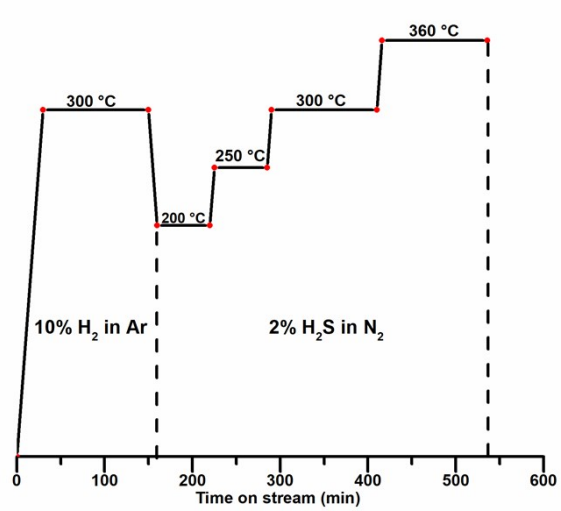

Figure S2. The scheme of the MoS_2-γ-Al_2O_3 catalyst sulfidation.

Note: To keep at 200 ℃ and 250 ℃ for 1 h, 300 ℃ and 360 ℃ for 2 h, and the heating and cooling rate is 10 ℃·min^{-1}.

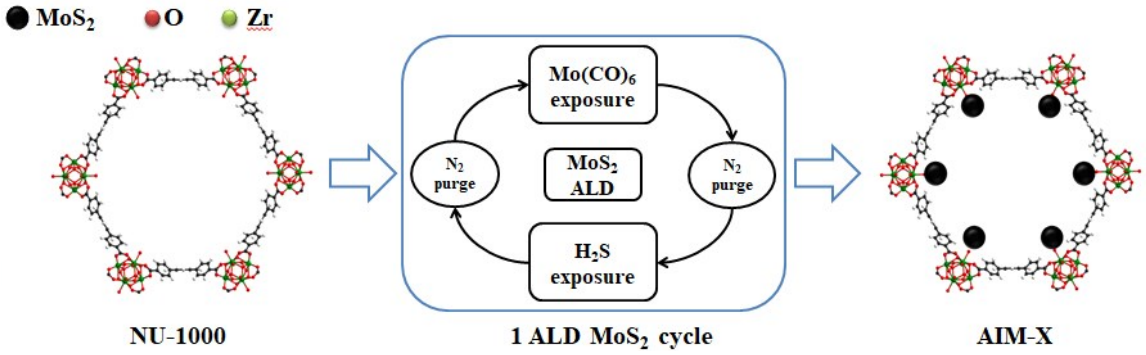

Figure S3. Schematic diagram of the ALD process for preparing AIM-X catalysts.

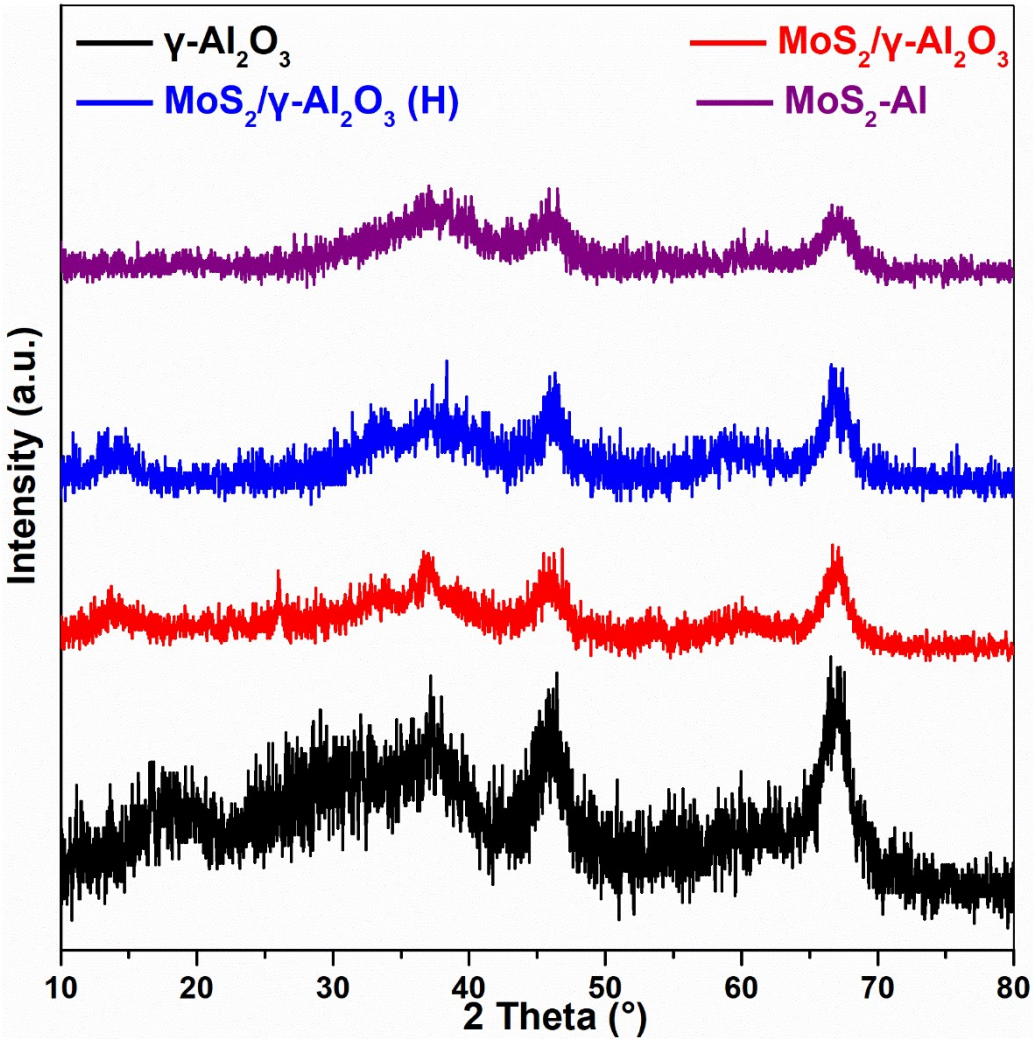

Figure S4. PXRD pattern of as-prepared γ-Al_2O_3 supported catalysts.

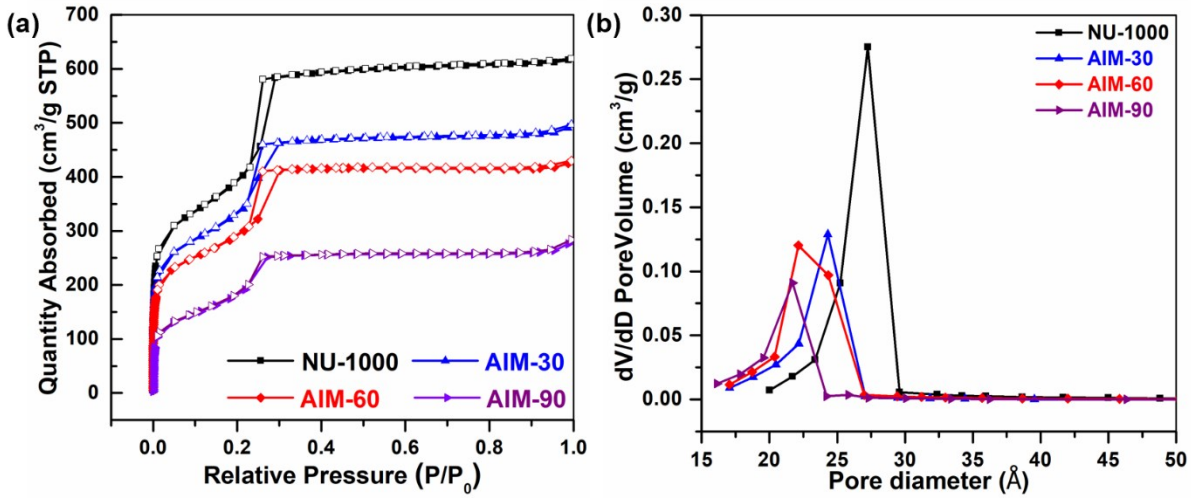

Figure S5. (a) N_2 physical adsorption-desorption isotherms of the synthesized AIM-X at 77 K. (b) Pore size distribution of the synthesized AIM-X.

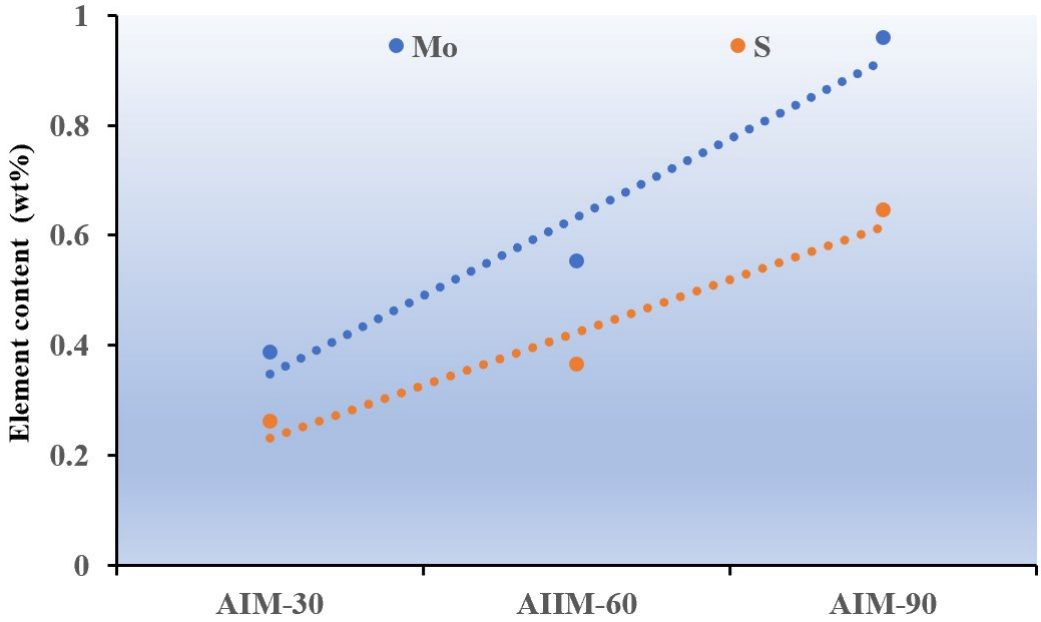

Figure S6. ICP-OES results of the synthesized AIM-X.

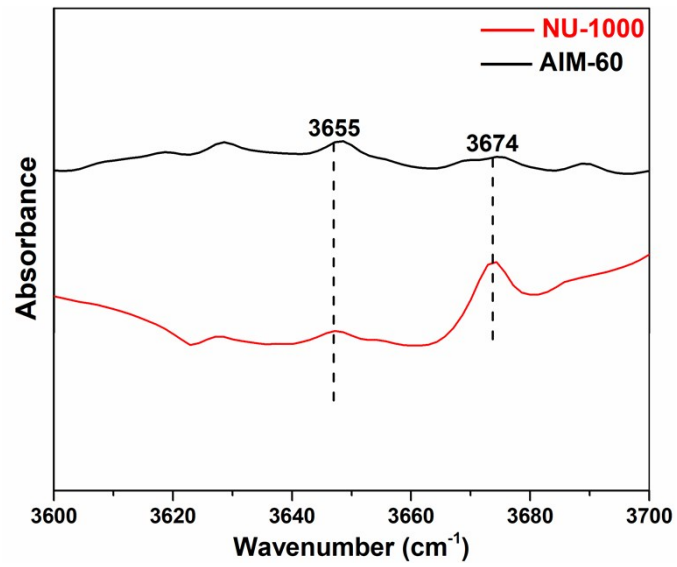

Figure S7. Fourier transform infrared spectroscopy of NU-1000 and AIM-60.

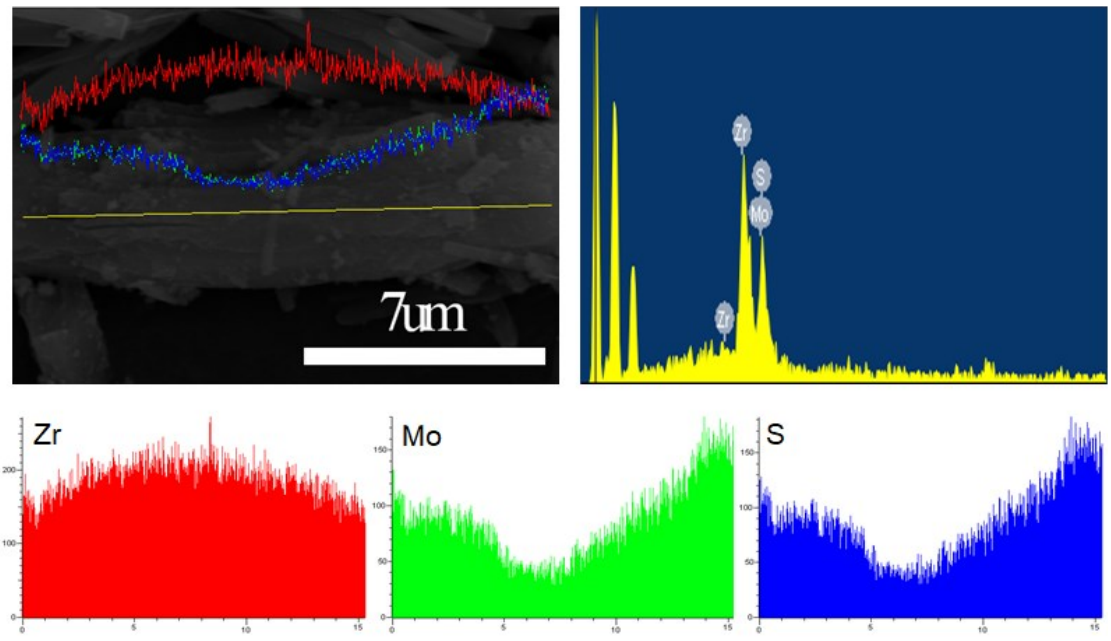

Figure S8. SEM-EDS linescan image of the AIM-60 sample.

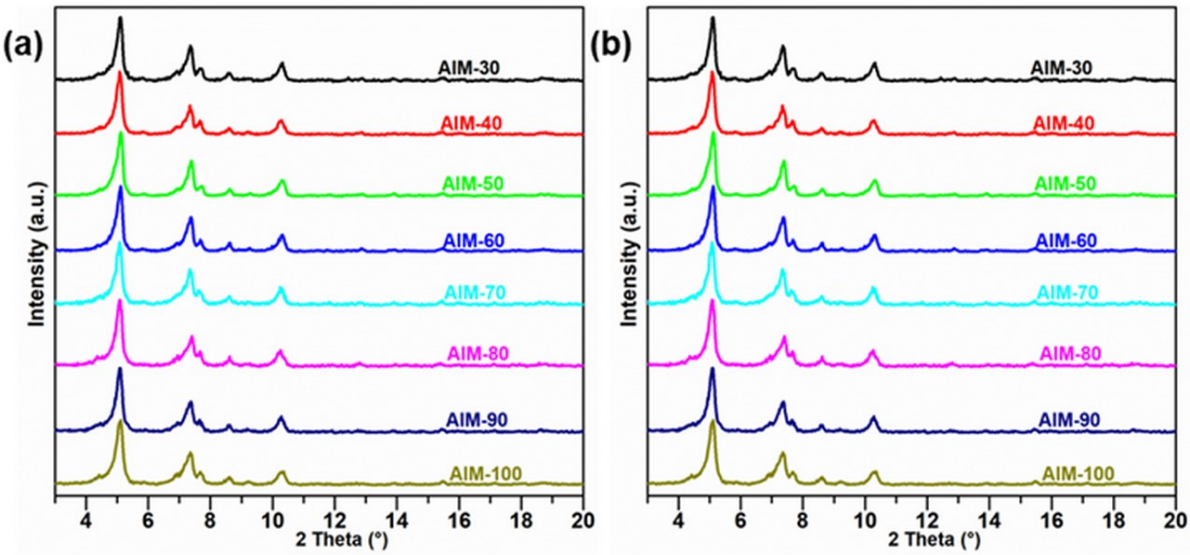

Figure S9. PXRD patterns of the AIM-X series catalysts before (a), and after (b) the HDS reaction.