Supporting Information

NiB_2O_4 (B = Mn or Co) Catalysts for NH_3-SCR of NO_x at low-temperature in Microwave Field

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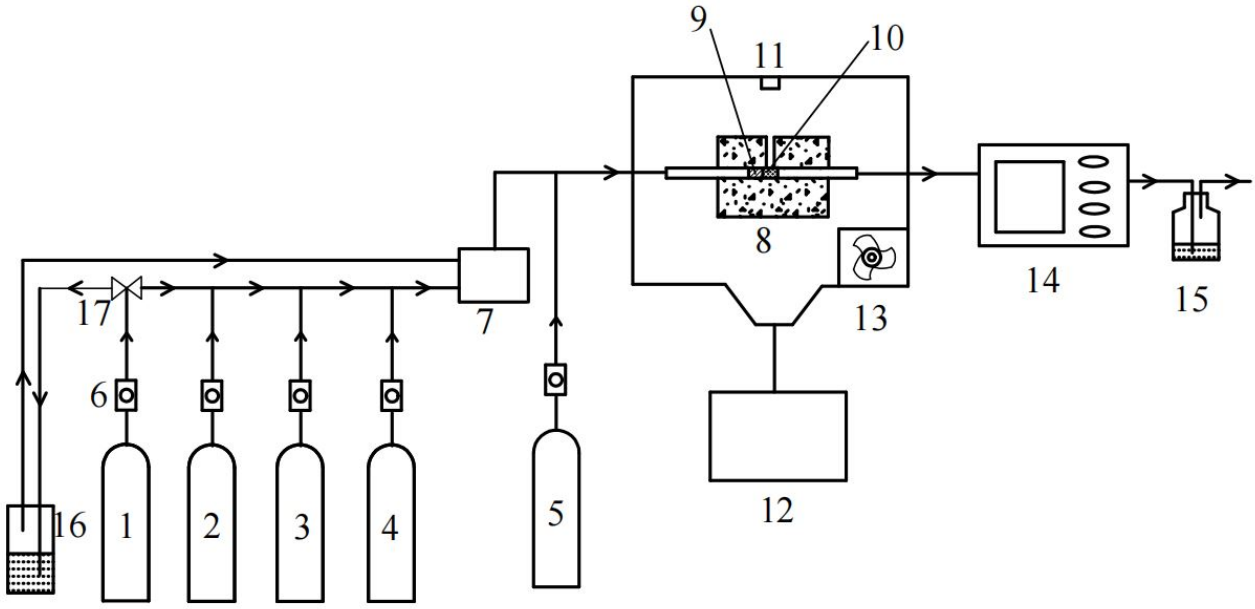

1-N_2, 2-O_2, 3-NO, 4-SO_2, 5-NH_3, 6-Mass flowmeter, 7-Air mixing tank, 8-, 9-Silicon powder, 10-Catalyst, 11-Infrared thermometer, 12-Magnetron, 13-Cooling fan, 14-NO_x analyzer, 15-Tail gas absorption bottle, 16-Bubble tower, 17-Reversing valve

Fig. S1. Schematic of catalytic reaction system under microwave field.

In the above Schematic, the main function of quartz wool block is to support reaction tube and magnetron at the same level, and heat preservation to reduce heat loss. The function of the pre- silicon powder bed is to preheat the mixed air, so as to avoid the catalyst bed being directly impacted by the cold air, resulting in the limited temperature rise of the catalyst bed.

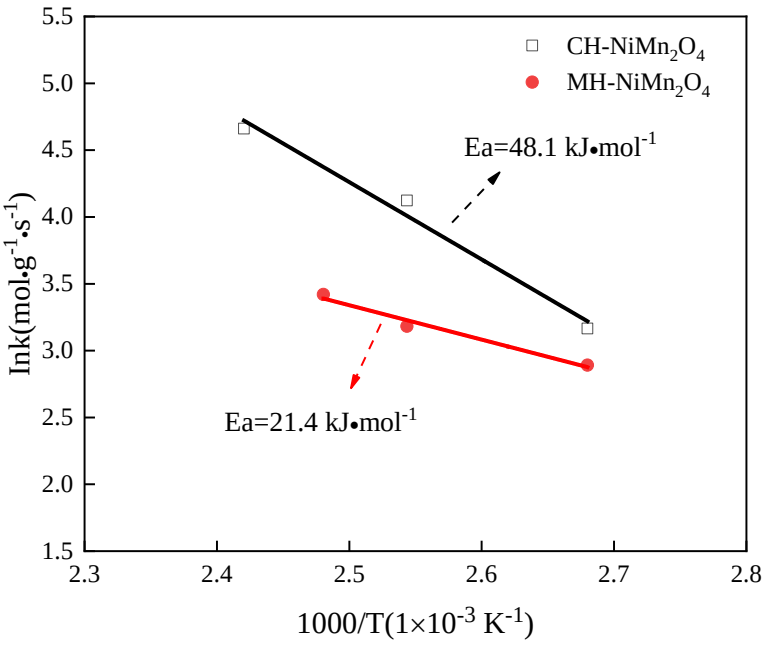

Fig. S2. Arrhenius plots for the NH_3-SCR over the $NiMn_2O_4$ catalyst.

The typical Arrhenius plot of lnk versus 1000/T for NH_3-SCR reaction under microwave and conventional heating over $NiMn_2O_4$ catalyst is shown in Fig. S2 (Sanati and Rezvani, 2018; Zheng et al., 2021). The apparent activation energy (Ea) for each reaction were determined by the absolute values of the slope of the fitting lines (Boningari et al., 2015). The Ea value of the SCR reaction under microwave heating (21.4 kJ·mol^{-1}) was obviously lower than that under conventional heating (48.1·kJ mol^{-1}), demonstrating the reduced reaction energy barrier and higher catalytic activity, which was consistent with the excellent de-NO_x activity at low-temperature. Microwave irradiation is the crucial factor leading to the decrease of Ea value in this reaction. Therefore, the microwave irradiation is thought to reduce the energy requirement of the reaction and activate the reacting molecules.

References

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Zheng Y, Liu Q, Shan C, Su Y, Fu K, Lu S, Han R, Song C, Ji N, Ma D (2021). Defective Ultrafine MnO(x) Nanoparticles Confined within a Carbon Matrix for Low-Temperature Oxidation of Volatile Organic Compounds. Environ Sci Technol, 55(8): 5403-5411