

## **Supplementary Materials**

### **Comparison of different metal-doping effect on Co<sub>3</sub>O<sub>4</sub> catalysts for the total oxidation of toluene and propane**

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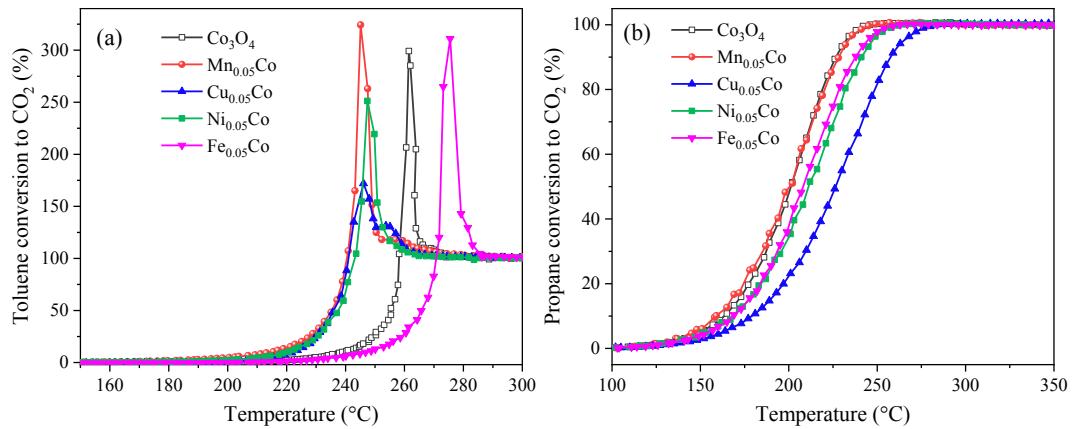


Figure S1. Variation of the (a) toluene conversion (b) propane conversion with the reaction temperature during the heating run.

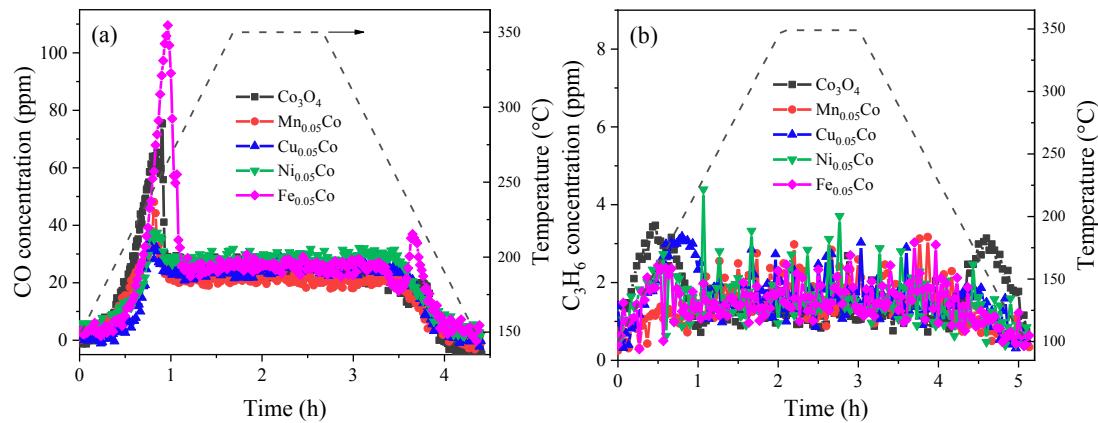


Figure S2. Evolution of (a) CO concentration in toluene oxidation and (b)  $\text{C}_3\text{H}_6$  concentration in propane oxidation during one heating–cooling catalytic cycle over the  $\text{Co}_3\text{O}_4$  and  $\text{Mn}_{0.05}\text{Co}$  catalysts.

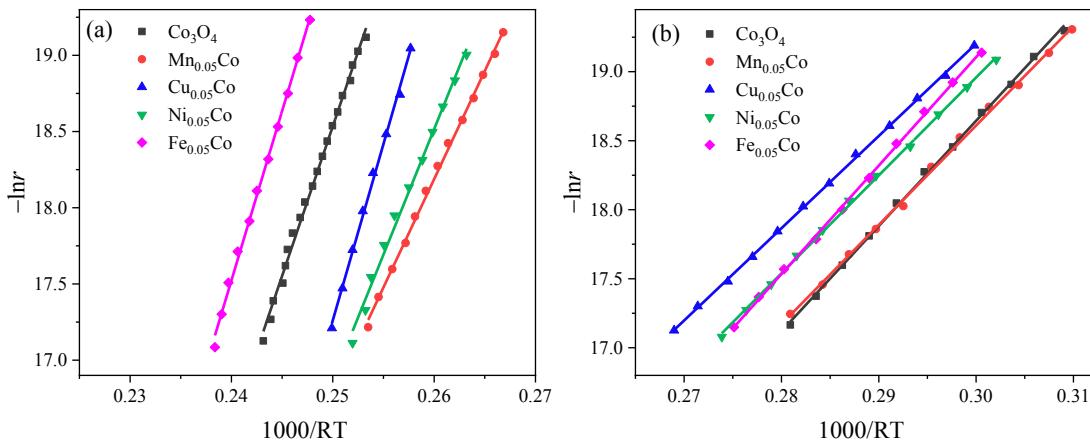


Figure S3. Arrhenius plots for (a) toluene oxidation (b) propane oxidation over  $\text{Co}_3\text{O}_4$  and  $\text{M}_{0.05}\text{Co}$  catalysts. (reaction conditions: toluene/propane concentration = 1000 ppm,  $\text{O}_2$  concentration = 21 vol.% and WHSV =  $40,000 \text{ mL h}^{-1} \text{ g}^{-1}$ ).

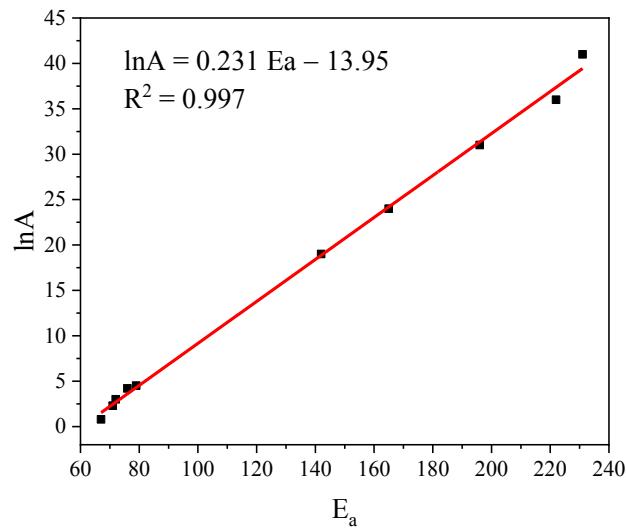


Figure S4. Constable plot of apparent pre-exponential factors as a function of apparent activation energies for toluene and propane oxidation over  $\text{Co}_3\text{O}_4$  and  $\text{M}_{0.05}\text{Co}$  catalysts.

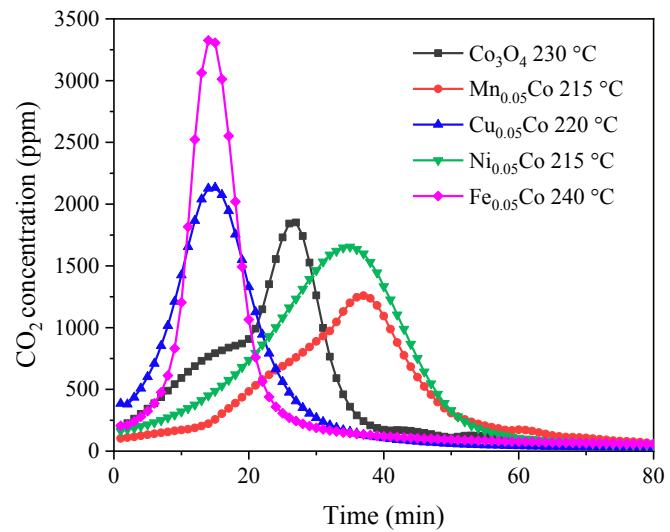


Figure S5. CO<sub>2</sub> evolution as a function of time on stream in air flow after 24-h stability test.

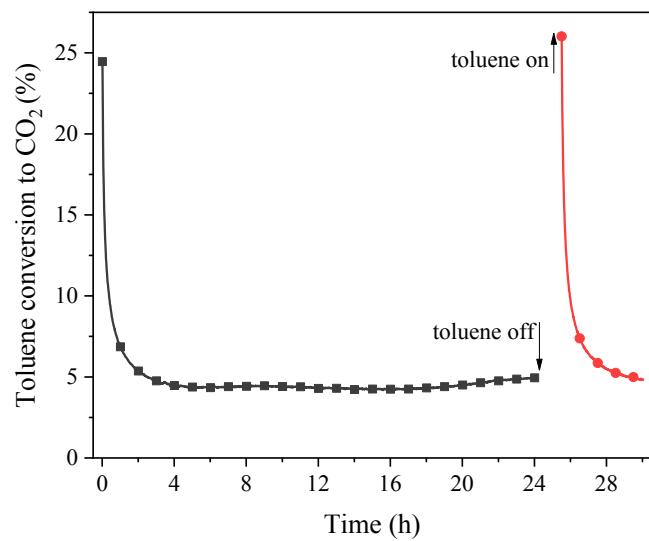


Figure S6. Toluene conversion to CO<sub>2</sub> as a function of time on stream over Co<sub>3</sub>O<sub>4</sub> catalyst at 230 °C.