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## **Pd/Co<sub>3</sub>O<sub>4</sub> 纳米颗粒负载于 Al<sub>2</sub>O<sub>3</sub> 纳米片高效催化甲烷燃烧**

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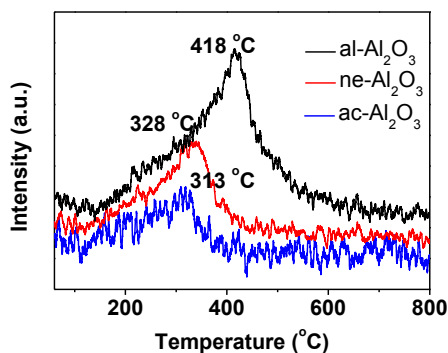
## **Pd/Co<sub>3</sub>O<sub>4</sub> Nanoparticles Inlaid in Alkaline Al<sub>2</sub>O<sub>3</sub> Nanosheets as an Efficient Catalyst for Catalytic Oxidation of Methane**

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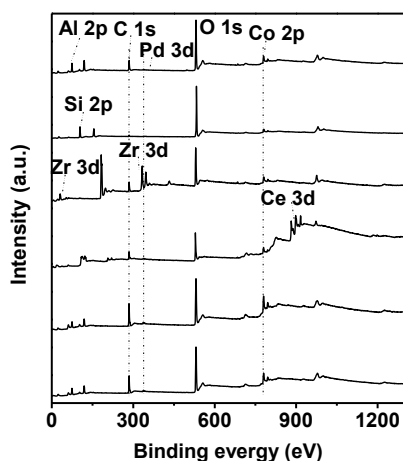
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The acid-base property of these  $\text{Al}_2\text{O}_3$  is explained by the  $\text{CO}_2$  temperature-program desorption, which is shown in Fig.S1. The detailed order of the  $\text{CO}_2$  desorption peaks' temperature follows the sequence of  $\text{al-Al}_2\text{O}_3 > \text{ne-Al}_2\text{O}_3 > \text{ac-Al}_2\text{O}_3$ , infirming that the alkalinity order of these  $\text{Al}_2\text{O}_3$  follows  $\text{al-Al}_2\text{O}_3 > \text{ne-Al}_2\text{O}_3 > \text{ac-Al}_2\text{O}_3$ .



**Fig.S1**  $\text{CO}_2$  temperature-program desorption spectra of  $\text{al-Al}_2\text{O}_3$ ,  $\text{ac-Al}_2\text{O}_3$ , and  $\text{ne-Al}_2\text{O}_3$ .

The surface concentration information of these examined catalysts are shown in Fig.S2 and listed in the Table S1 below, showing that the examined catalysts have no residual alkali metals, indicating that Na was removed in the washing and centrifugation process.



**Fig.S2** The survey spectra of (a)  $\text{Pd}/\text{Co}_3\text{O}_4/\text{alkaline Al}_2\text{O}_3$ , (b)  $\text{Pd}/\text{Co}_3\text{O}_4/\text{SiO}_2$ , (c)  $\text{Pd}/\text{Co}_3\text{O}_4/\text{ZrO}_2$ , (d)  $\text{Pd}/\text{Co}_3\text{O}_4/\text{CeO}_2$ , (e)  $\text{Pd}/\text{Co}_3\text{O}_4/\text{acidic Al}_2\text{O}_3$ , and (f)  $\text{Pd}/\text{Co}_3\text{O}_4/\text{neutral Al}_2\text{O}_3$ .

**Table S1 The surface composition of (a) Pd/Co<sub>3</sub>O<sub>4</sub>/alkaline Al<sub>2</sub>O<sub>3</sub>, (b) Pd/Co<sub>3</sub>O<sub>4</sub>/SiO<sub>2</sub>, (c) Pd/Co<sub>3</sub>O<sub>4</sub>/ZrO<sub>2</sub>, (d) Pd/Co<sub>3</sub>O<sub>4</sub>/CeO<sub>2</sub>, (e) Pd/Co<sub>3</sub>O<sub>4</sub>/acidic Al<sub>2</sub>O<sub>3</sub>, and (f) Pd/Co<sub>3</sub>O<sub>4</sub>/neutral Al<sub>2</sub>O<sub>3</sub>.**

Sample	Al/Si /Zr/Ce	C	O	Pd	Co
0.6Pd/9.4Co <sub>3</sub> O <sub>4</sub> /al-Al <sub>2</sub> O <sub>3</sub>	30.4	21.4	45.5	0.2	2.6
0.6Pd/9.4Co <sub>3</sub> O <sub>4</sub> /SiO <sub>2</sub>	34.8	4.4	58.3	0.1	2.4
0.6Pd/9.4Co <sub>3</sub> O <sub>4</sub> /ZrO <sub>2</sub>	22.2	28.8	43.7	-	3.7
0.6Pd/9.4Co <sub>3</sub> O <sub>4</sub> /CeO <sub>2</sub>	10.7	35.8	48.2	0.6	4.6
0.6Pd/9.4Co <sub>3</sub> O <sub>4</sub> /ac-Al <sub>2</sub> O <sub>3</sub>	17.6	39.0	38.4	0.3	4.8
0.6Pd/9.4Co <sub>3</sub> O <sub>4</sub> /ne-Al <sub>2</sub> O <sub>3</sub>	21.1	33.7	41.7	0.2	3.3

**Table S2 The actual Pd content of the catalysts.**

Sample	Pd content/%
0.6Pd/9.4Co <sub>3</sub> O <sub>4</sub> /al-Al <sub>2</sub> O <sub>3</sub>	0.57
0.6Pd/9.4Co <sub>3</sub> O <sub>4</sub> /SiO <sub>2</sub>	0.56
0.6Pd/9.4Co <sub>3</sub> O <sub>4</sub> /ZrO <sub>2</sub>	0.59
0.6Pd/9.4Co <sub>3</sub> O <sub>4</sub> /CeO <sub>2</sub>	0.60
0.6Pd/9.4Co <sub>3</sub> O <sub>4</sub> /ac-Al <sub>2</sub> O <sub>3</sub>	0.58
0.6Pd/9.4Co <sub>3</sub> O <sub>4</sub> /ne-Al <sub>2</sub> O <sub>3</sub>	0.61