

Supporting Information for

Facile synthesis of supported $\text{RuO}_2 \cdot x\text{H}_2\text{O}$ nanoparticles on Co-Al hydrotalcite for catalytic oxidation of alcohol: effect of the temperature pretreatments

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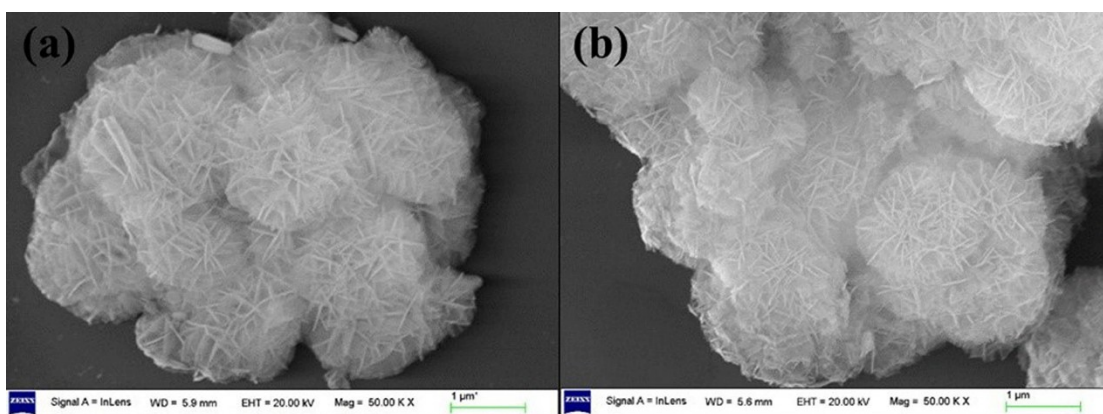


Fig. S1 SEM images of RuO₂/CoAl-LDH_{CP} (a) and RuO₂/CoAl-LDH_{DP} (b)

Table S1. The XPS Ru 3p_{3/2} results of RuO₂/CoAl-LDH_{CP} and RuO₂/CoAl-LDH_{DP} catalysts

Catalyst	Ru 3p _{3/2}			
	Compound Type	B. E. (eV)	FWHM	Fraction (%)
RuO ₂ /CoAl-LDH _{DP}	RuO ₂ ·xH ₂ O	464.9	3.61	36.6
	RuO ₂	462.9	3.42	63.4
RuO ₂ /CoAl-LDH _{CP}	RuO ₂ ·xH ₂ O	464.7	3.61	34.84
	RuO ₂	462.7	3.42	65.16

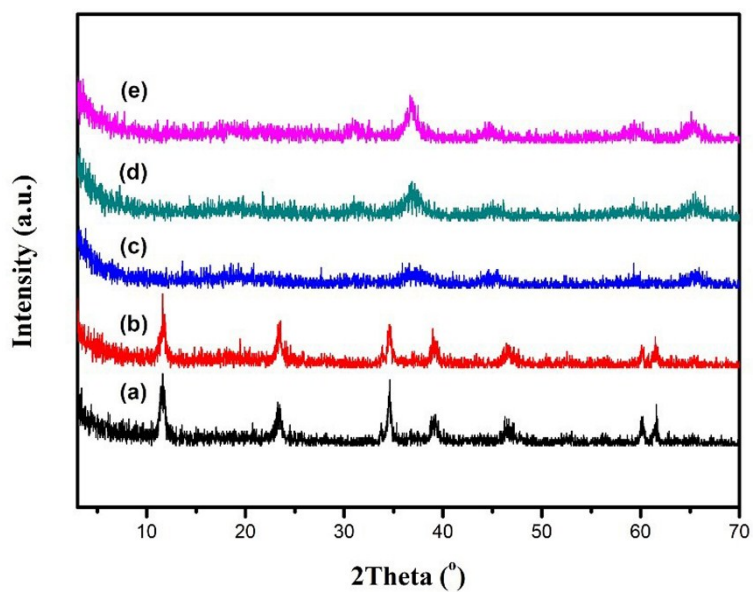


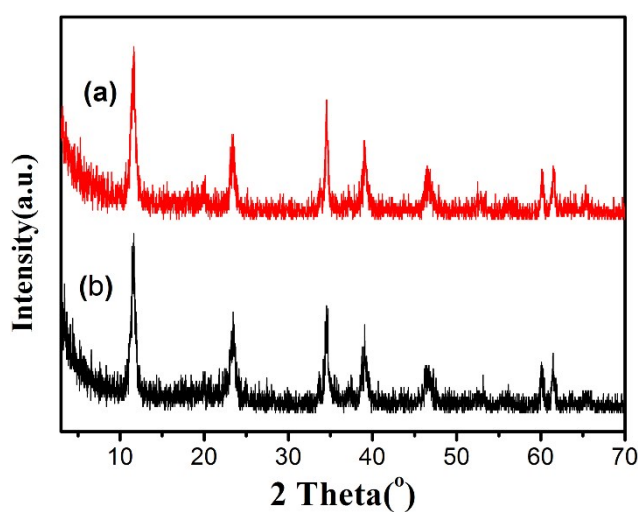
Fig. S2 XRD patterns of RuO₂/CoAl-LDH_{CP} (a), RuO₂/CoAl-LDH_{CP}-110°C (b), RuO₂/CoAl-LDH_{CP}-200°C (c), RuO₂/CoAl-LDH_{CP}-300°C (d), RuO₂/CoAl-LDH_{CP}-500°C (e)

Table S2. The XPS results of several catalysts with different pretreated temperature

Catalyst	Co 2p _{3/2}				Ru 3p _{3/2}			
	Compound Type	B. E. (eV)	FWHM	Fraction (%)	Compound Type	B. E. (eV)	FWHM	Fraction (%)
RuO ₂ /CoAl-LDH _{CP}	Co ²⁺	780.4	2.69	50.35	RuO ₂ ·xH ₂ O	462.7	3.42	34.84
	Co ³⁺	-	3.04	-	RuO ₂	464.7	3.61	65.16
RuO ₂ /CoAl-LDH _{CP} -110°C	Co ²⁺	780.4	2.69	49.06	RuO ₂ ·xH ₂ O	462.5	3.42	32.83
	Co ³⁺	-	3.04	-	RuO ₂	464.7	3.61	67.17
RuO ₂ /CoAl-LDH _{CP} -200°C	Co ²⁺	781.0	2.69	15	RuO ₂ ·xH ₂ O	462.3	3.42	31.08
	Co ³⁺	779.2	3.04	64.83	RuO ₂	464.4	3.61	68.92
RuO ₂ /CoAl-LDH _{CP} -300°C	Co ²⁺	781.2	2.69	15.28	RuO ₂ ·xH ₂ O	462.0	3.42	23.65
	Co ³⁺	779.2	3.04	71.35	RuO ₂	464.3	3.61	76.35
RuO ₂ /CoAl-LDH _{CP} -500°C	Co ²⁺	781.2	2.69	16.10	RuO ₂ ·xH ₂ O	461.8	3.42	20.86
	Co ³⁺	779.2	3.04	74	RuO ₂	464.4	3.61	79.14

Table S3. The XPS Co 2p_{3/2} results of of the fresh RuO₂/CoAl-LDH_{CP}-200°C and the used RuO₂/CoAl-LDH_{CP}-200°C

Catalyst	B. E. (eV)		Fraction (%)	
	Co ²⁺	Co ³⁺	Co ²⁺	Co ³⁺
RuO ₂ /CoAl-LDH-200°C (fresh)	781.0eV	779.3eV	15%	64.83%
RuO ₂ /CoAl-LDH-200°C (used)	780.8eV	779.2eV	28.42%	57.77%

**Fig. S3** XRD patterns of RuO₂/CoAl-LDH_{CP}-5% (a), RuO₂/CoAl-LDH_{CP}-7% (b)

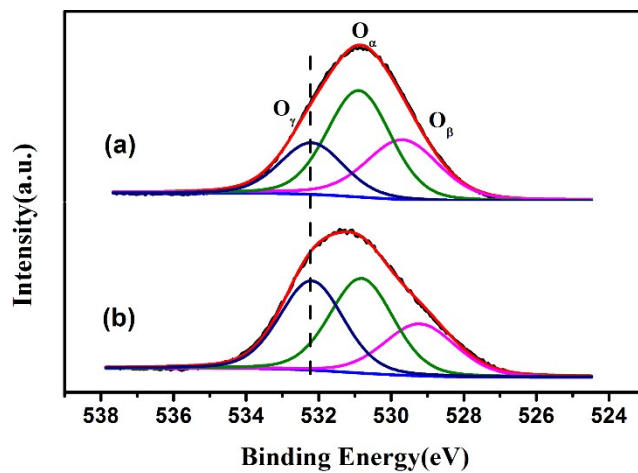


Fig. S4 XPS spectra in O1s of the fresh RuO₂/CoAl-LDH_{CP}-200°C (a) and the used RuO₂/CoAl-LDH_{CP}-200°C (b).

Table S4. The XPS O1s results of of the fresh RuO₂/CoAl-LDH_{CP}-200°C and the used RuO₂/CoAl-LDH_{CP}-200°C

Catalyst	B. E. (eV)			Fraction (%)		
	O _β	O _α	O _γ	O _β	O _α	O _γ
RuO ₂ /CoAl-LDH-200°C (fresh)	529.7eV	530.9eV	532.2 eV	29.52	47.46	23.02
RuO ₂ /CoAl-LDH-200°C (used)	529.2eV	530.8eV	532.2eV	24.21	39.00	36.79