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Ga_2O_3 改性 Cu/SiO_2 催化剂降低水蒸气催化重整产物中 CO 选择性

黄静静 [1]，蔡金孟 [1]，马奎 [1]，丁彤 [1]，田野 [1]，张静 [2]，李新刚 [1,*]

[1] 天津大学化工学院，天津化学化工协同创新中心，天津市应用催化科学与工程重点实验室，天津 300354

[2] 中国科学院，北京高能物理研究所，北京同步辐射装置，北京 100049

Ga_2O_3-modified Cu/SiO_2 Catalysts with Low CO Selectivity for Catalytic Steam Reforming

HUANG Jingjing [1], CAI Jinmeng [1], MA Kui [1], DING Tong [1], TIAN Ye [1], ZHANG Jing [2], LI Xingang [1,*]

[1] Collaborative Innovation Center of Chemical Science and Engineering (Tianjin), Tianjin Key Laboratory of Applied Catalysis Science and Engineering, School of Chemical Engineering & Technology, Tianjin University, Tianjin 300354, P. R. China.

[2] Beijing Synchrotron Radiation Facility, Institute of High Energy Physics, Chinese Academy of Sciences, Beijing 100049, China.

[*]Corresponding author. Email: xingang_li@tju.edu.cn; Tel.: 13512925257.

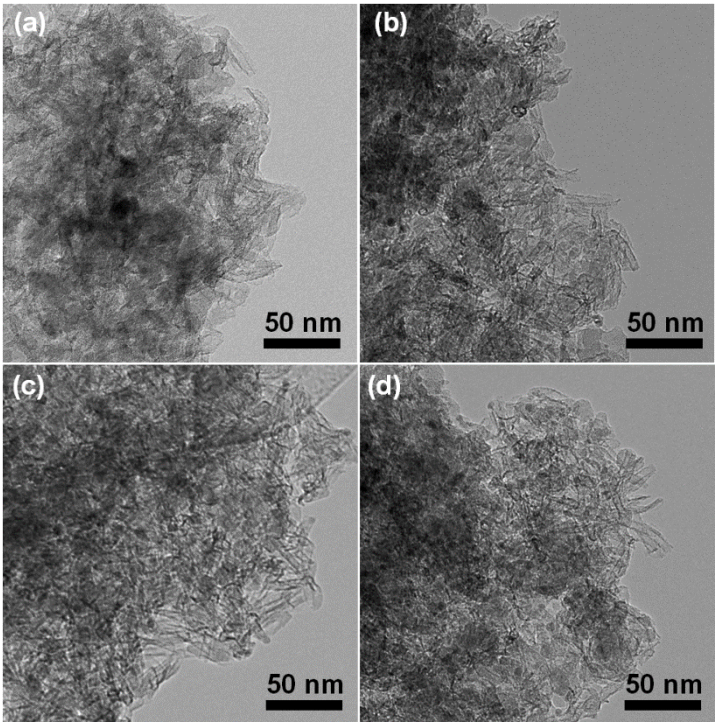

图 S1　催化剂的 TEM 图片

Fig. S1　TEM images of the catalysts. (a) Cu/SiO_2, (b) 1Ga-Cu/SiO_2, (c) 5Ga-Cu/SiO_2, (d) 10Ga-Cu/SiO_2.

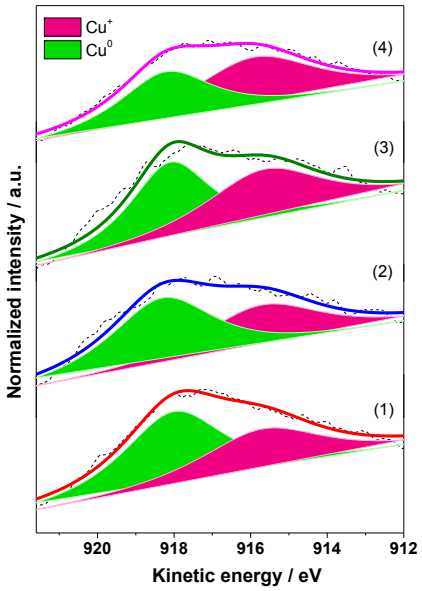

图 S2　还原后催化剂的 Cu LMM 俄歇谱图

(1) Cu/SiO_2 催化剂；(2) 1Ga-Cu/SiO_2 催化剂；(3) 5Ga-Cu/SiO_2 催化剂；(4) 10Ga-Cu/SiO_2 催化剂

Fig. S2　Cu LMM Auger spectra of the reduced catalysts.

(1) Cu/SiO_2, (2) 1Ga-Cu/SiO_2, (3) 5Ga-Cu/SiO_2, (4) 10Ga-Cu/SiO_2.

表 S1　催化剂的还原度计算结果

Table S1　The calculation results of reduction degree of the catalysts.

Catalyst	Cu loading	TPR result			Cu LMM XAES result	
		S	$C_{(Cu)}$ (10^{-4} mol)	$R_{(Cu\ \%)}$	$Cu^{+}/(Cu^{0} + Cu^{+})$	$R_{(Cu\ \%)}$
Cu/SiO_2	24.5	11304	0.935	0.808	0.414	0.793
$1Ga\text{-}Cu/SiO_2$	24.2	10833	0.896	0.784	0.430	0.785
$5Ga\text{-}Cu/SiO_2$	23.7	10177	0.842	0.752	0.497	0.752
$10Ga\text{-}Cu/SiO_2$	23	9098	0.753	0.693	0.573	0.714
CuO		45610				

表 S2　催化剂在 380 °C 的活性和选择性结果汇总

Table S2　The results of catalytic activity and selectivity in 380 °C of the catalysts.

Catalyst	$C_{(DME\ \%)}$	$Y_{(H_2\ \%)}$	$S_{(CO_2\ \%)}$	$S_{(CO\ \%)}$	$P_{(H_2\ mol\ gCu^{-1}\ h^{-1})}$
Cu/SiO_2	90.7	91.8	88.5	11.5	4.52
$1Ga\text{-}Cu/SiO_2$	94.3	93.0	91.5	8.5	4.70
$5Ga\text{-}Cu/SiO_2$	99.8	98.7	95.2	4.8	5.02
$10Ga\text{-}Cu/SiO_2$	98.0	95.9	93.2	6.8	4.91
Ref.			3.55 [1]; 1.62 [2]		

表中 $C_{(DME\ \%)}$表示 DME 转化率；$Y_{(H_2\ \%)}$表示氢气收率；$S_{(CO_2\ \%)}$表示二氧化碳选择性；$S_{(CO\ \%)}$表示一氧化碳选择性；$P_{(H_2\ mol\ gCu^{-1}\ h^{-1})}$表示氢气时空收率。

References

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