

探究 Cu/ZnO 相互作用对 CO₂ 加氢制甲醇反应性能的影响

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Understanding the Role of Cu/ZnO Interaction in CO₂ Hydrogenation to Methanol

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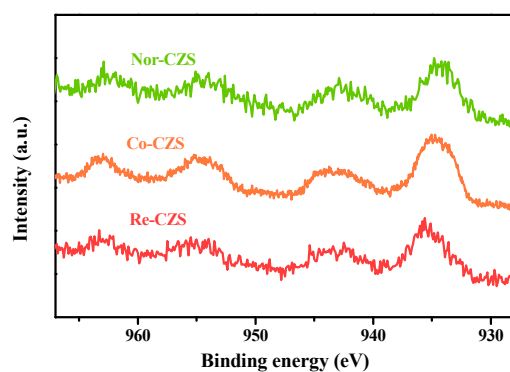


Fig. S1 XPS spectrum of the calcined catalysts.

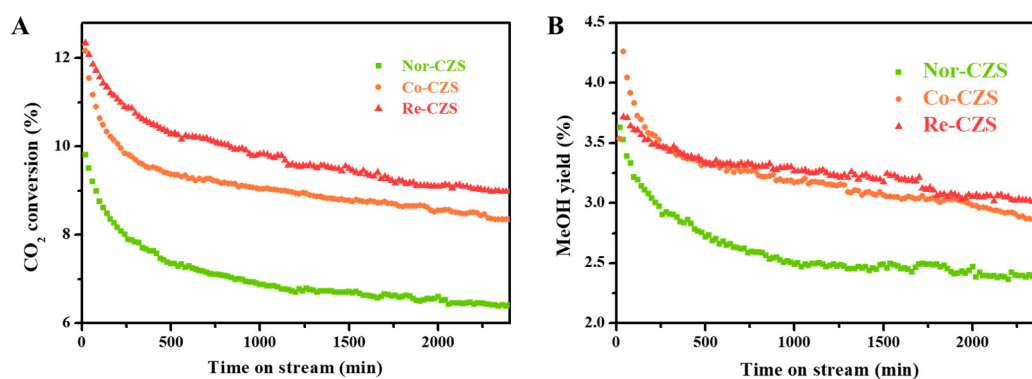


Fig. S2 Activity evolution, expressed as (A) CO₂ conversion (%) and (B) methanol yield (%), for Nor-CZS (green squares), Co-CZS (orange circles) and Re-CZS (red triangles).

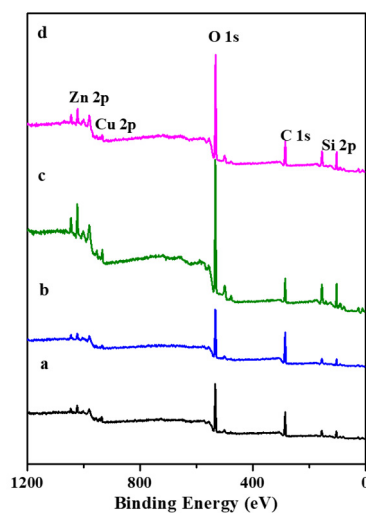


Fig. S3 XPS survey spectra of Re-CZS, for (a) after calcined (b) after reduced, (c) reacted for 8h and (d) reacted for 40 h.

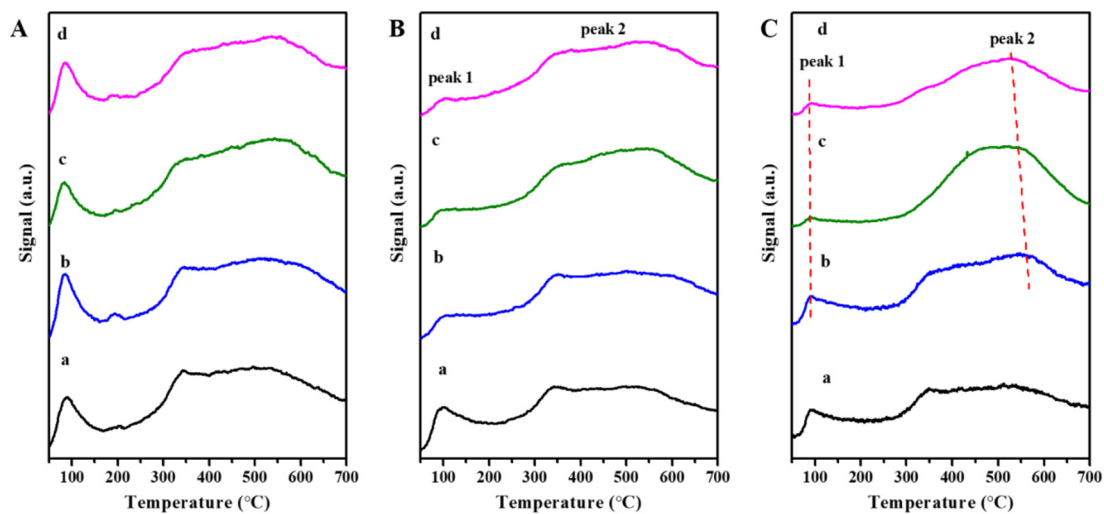


Fig. S4 (A) CO₂-TPD, (B) CO-TPD, (C) H₂-TPD of Re-CZS catalysts (a) Re-CZS-C, (b) Re-CZS-0, (c) Re-CZS-8, (d) Re-CZS-40.

Table S1 Surface atomic ratio derived from XPS survey spectra.

| | Surface atomic ratio | | |
|-----------|----------------------|-------------------|-------------------|
| | Cu/(Cu + Zn) | Cu/(Cu + Si + Zn) | Zn/(Cu + Si + Zn) |
| Re-CZS-C | 0.491 | 0.096 | 0.099 |
| Re-CZS-0 | 0.350 | 0.058 | 0.110 |
| Re-CZS-8 | 0.396 | 0.057 | 0.089 |
| Re-CZS-40 | 0.395 | 0.039 | 0.060 |

Table S2 CO₂/CO/H₂ -TPD.

| | CO ₂ desorption | | CO desorption | | H ₂ desorption | |
|-----------|----------------------------|-------------------------|-------------------------|-------------------------|---------------------------|-------------------------|
| | Peak 1 | Peak 2 | Peak 1 | Peak 2 | Peak 1 | Peak 2 |
| | (mmol·g ⁻¹) | (mmol·g ⁻¹) | (mmol·g ⁻¹) | (mmol·g ⁻¹) | (mmol·g ⁻¹) | (mmol·g ⁻¹) |
| Re-CZS-C | 0.023 | 0.178 | 0.122 | 0.551 | 0.027 | 0.136 |
| Re-CZS-0 | 0.027 | 0.171 | 0.060 | 0.716 | 0.028 | 0.163 |
| Re-CZS-8 | 0.017 | 0.193 | 0.036 | 0.775 | 0.017 | 0.570 |
| Re-CZS-40 | 0.023 | 0.168 | 0.019 | 0.841 | 0.021 | 0.339 |