Study of promoted Cu/ZnO and Cu/ZrO_2 catalysts for dimethyl adipate hydrogenolysis

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Evaluation of the support effect in XRF analysis

To evaluate the effect of ZrO_2 and ZnO during the XRF, the physical mixtures of 10% CuO and 90% of ZrO_2 or ZnO were prepared from the standard chemicals. When the sample was 3-times measured the average composition was estimated (Table SI1). From this there is a clear observation that CuO content is overestimated.

Table SI1.: Average composition of physical mixtures.

	Average composition, CuO	Average composition, support
10% CuO and 90 % ZnO	10.3 %	89.7 %
10% CuO and 90 % ZrO_2	11.0 %	89.0%

	1st peak	2nd peak
Cu/ZrO_2_DP	38%	62%
CuZn/ZrO_2_DP	23%	77%
CuNi/ZrO_2_DP	53%	47%
CuCo/ZrO_2_DP	40%	60%

Table SI2.: Ratio of deconvoluted peaks for ZrO_2-based catalysts.

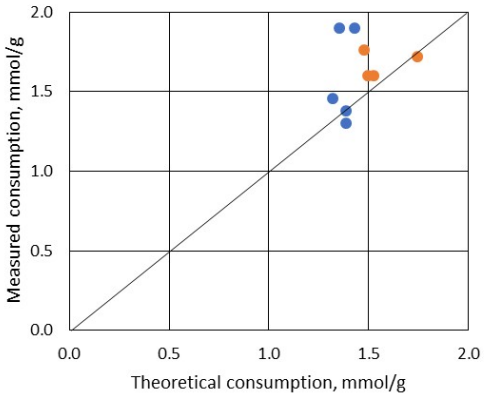

Figure SI1.: Comparison of theoretical and measured hydrogen consumption during TPR-H_2.

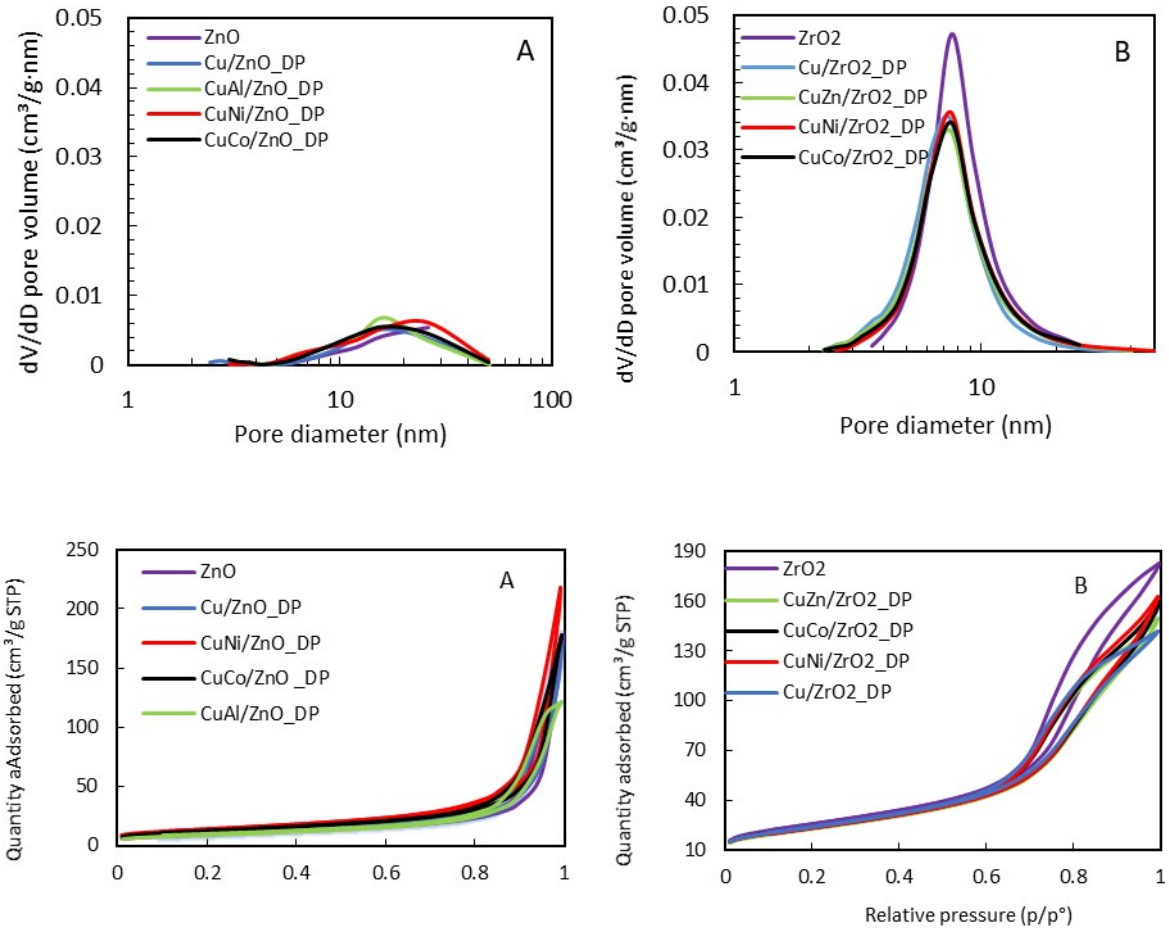

Figure SI2.: Pore size distribution and adsorption-desorption hysteresis of (A) ZnO-supported and (B) ZrO_2-supported catalysts.

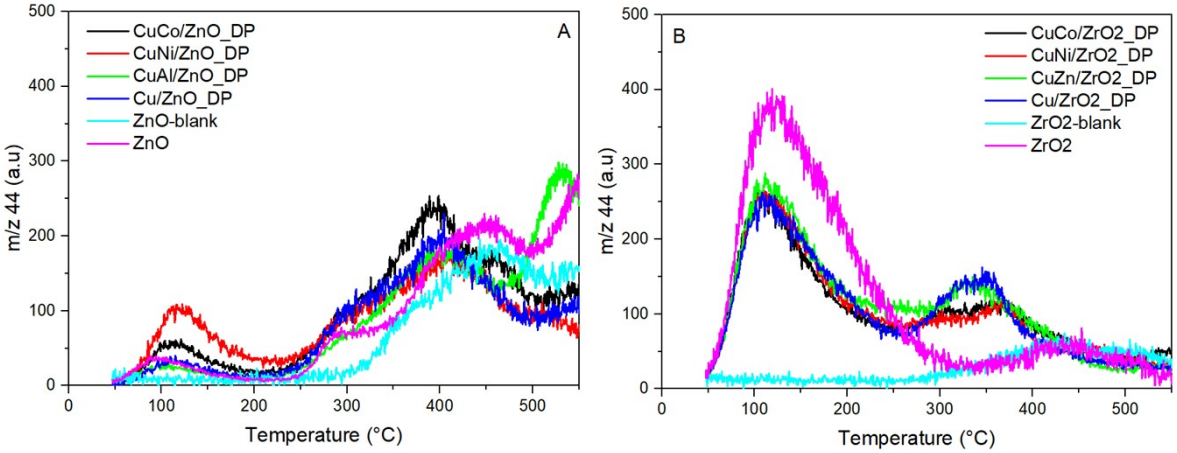

Figure SI3.: TPD-CO_2 of (A) ZnO-based catalysts and (B) ZrO_2-based catalysts.

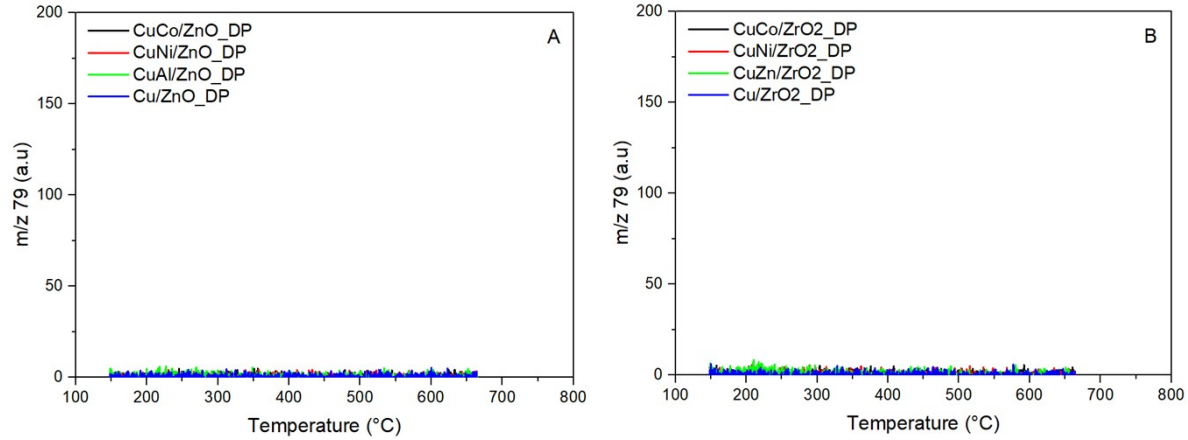

Figure SI4.: TPD-pyr of (A) ZnO-based catalysts and (B) ZrO_2-based catalysts.

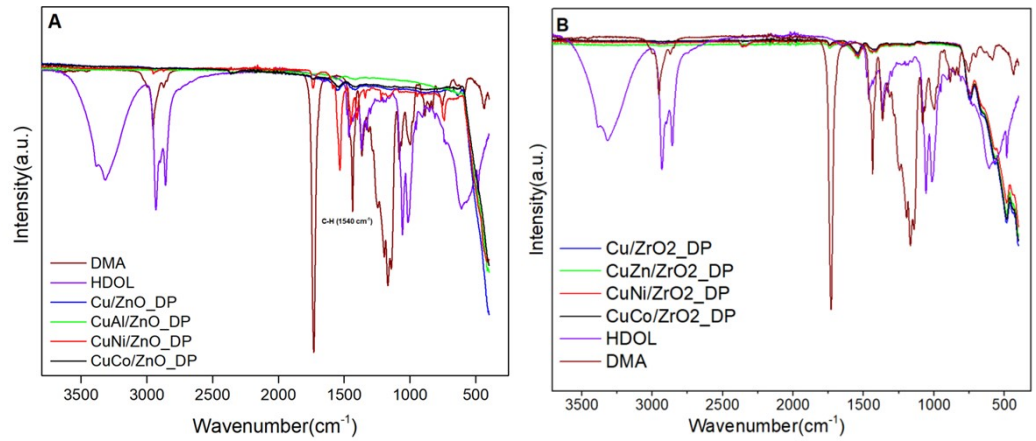

Figure SI5.: FTIR spectra of the spent catalysts and pure HDOL and DMA compounds.

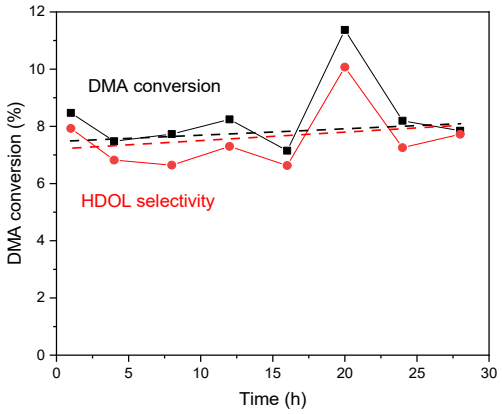

Figure SI6.: The stability test results (DMA conversion and HDOL selectivity) for Cu/ZrO_2_DP catalyst for 28 h at 220°C and 100 bar.

Table SI3.: The change in DMA conversion after 8h of experiment; T=220°C, p=100 bar

Sample name	DMA conversion (%) at t = 0h	DMA conversion (%) at t = 8h
Cu/ZrO_2_DP	9	9
$CuZn/ZrO_2$_DP	7	8
$CuNi/ZrO_2$_DP	12	10
$CuCo/ZrO_2$_DP	15	15
Cu/ZnO_DP	51	49
CuAl/ZnO_DP	23	21
CuNi/ZnO_DP	6	5