Supplementary Information (SI) for RSC Advances.

Highly efficient CuNi-ZrO_2 nanaocomposite for selective hydrogenation of levulinic acid to *γ*-valerolactone

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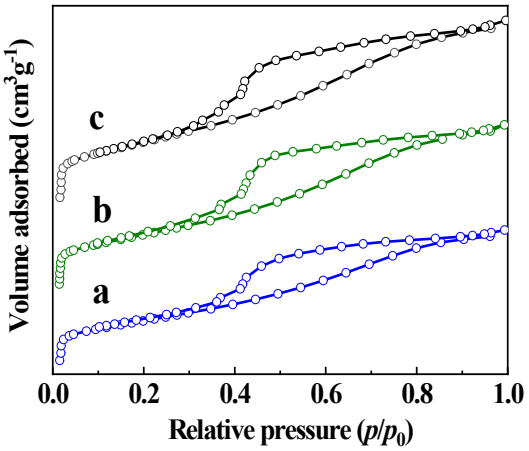

Figure S1. Adsorption-desorption isotherms of $Cu_{0.5}$-ZrO_2 (a), $Ni_{0.5}$-ZrO_2 (b) and $Cu_{0.05}Ni_{0.45}$-ZrO_2 (c) catalysts.

Table S1. Textural properties of the $Cu_{0.5}$-ZrO_2, $Ni_{0.5}$-ZrO_2 and $Cu_{0.05}Ni_{0.45}$-ZrO_2 catalysts.

Catalyst	Specific surface area ($m^2\ g^{-1}$)	Pore volume ($cm^3\ g^{-1}$)	Average pore size (nm)
$Cu_{0.5}/ZrO_2$	85	0.13	3.6
$Ni_{0.5}/ZrO_2$	94	0.16	3.5
$Cu_{0.05}Ni_{0.45}/ZrO_2$	101	0.18	3.7

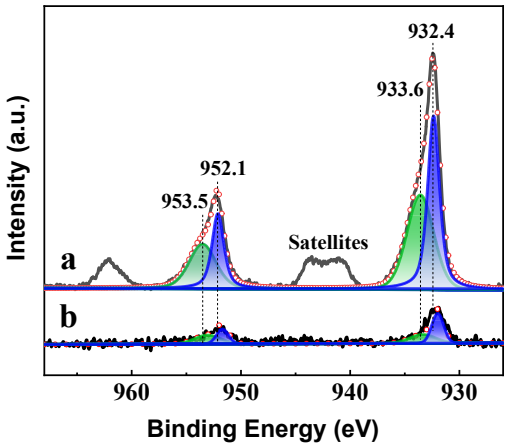

Figure S2. XPS spectra of Cu2p for the $Cu_{0.5}/ZrO_2$ (a) and $Cu_{0.05}$-$Ni_{0.45}/ZrO_2$ (b) catalysts.

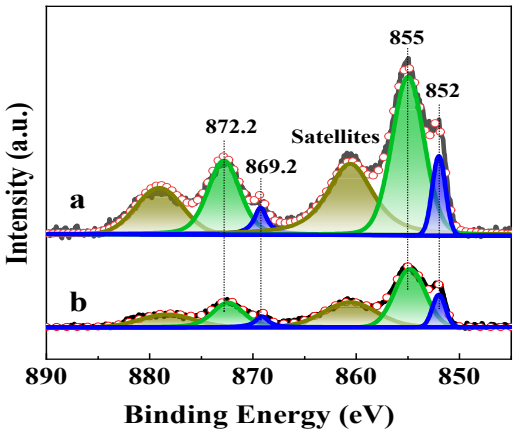

Figure S3. XPS spectra of Ni2p for the $Cu_{0.5}/ZrO_2$ (a) and $Cu_{0.05}$-$Ni_{0.45}/ZrO_2$ (b) catalysts.

Table S2. Catalytic performance for the hydrogenation of LA to GVL on different catalysts.

Entry	Catalyst	T/℃	P_{H2}/Mpa	t/h	LA Conv.	GVL Sel.	Ref.
1	Ni/SiO_2	250	1	1	99.9	87	1
2	Ni/TiO_2	270	1	3	99.9	99.1	2
3	Cu/ZrO_2	200	3.5	5	100	100	3
4	Cu/Al_2O_3	200	3.5	5	100	100	3
5	$Cu\text{-}Ni/SiO_2$	250	1	8	99.1	99.2	4
6	$Ni\text{-}Cu/Al_2O_3$	220	3	6	100	>99	5
7	$CuAgZrO_2$	200	3	4	100	>99	6
8	$Ni\text{-}Cu/ZrO_2$	200	3	1.5	>99.9	>99.9	This work

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