

# Selectivity-Controllable Hydrogen Transfer Reduction of $\alpha$ , $\beta$ -Unsaturated Aldehydes Over the High-Entropy Catalysts

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## Supporting Information

### 1. The characterization of catalysts

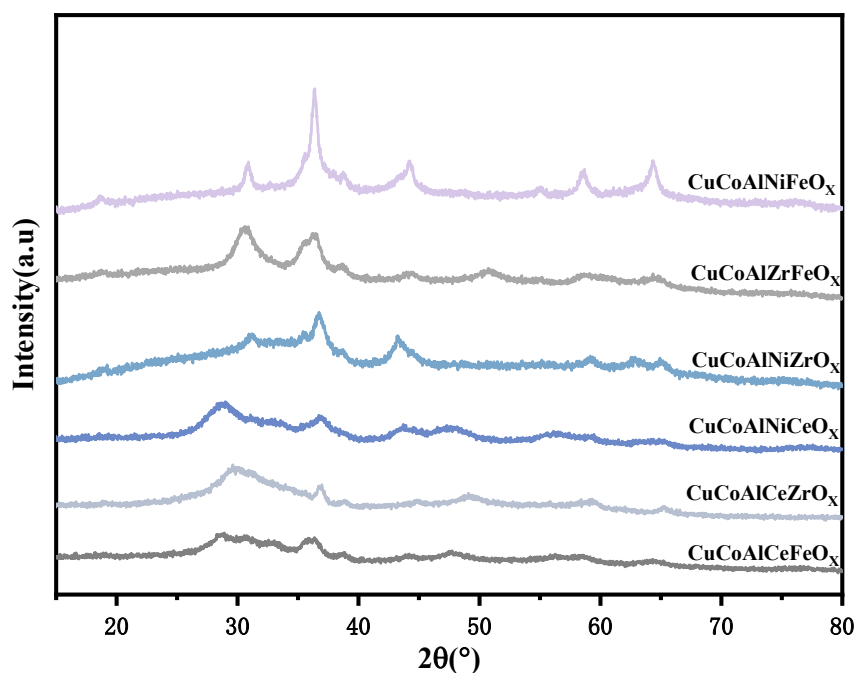
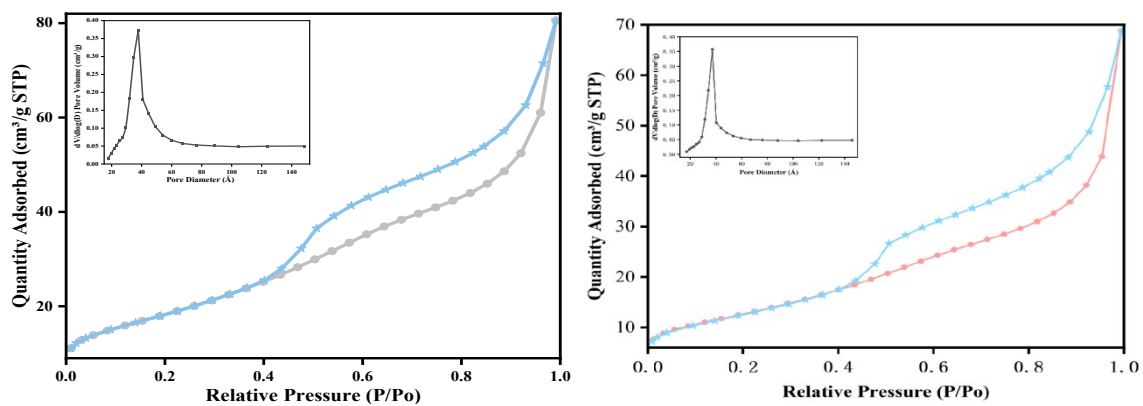


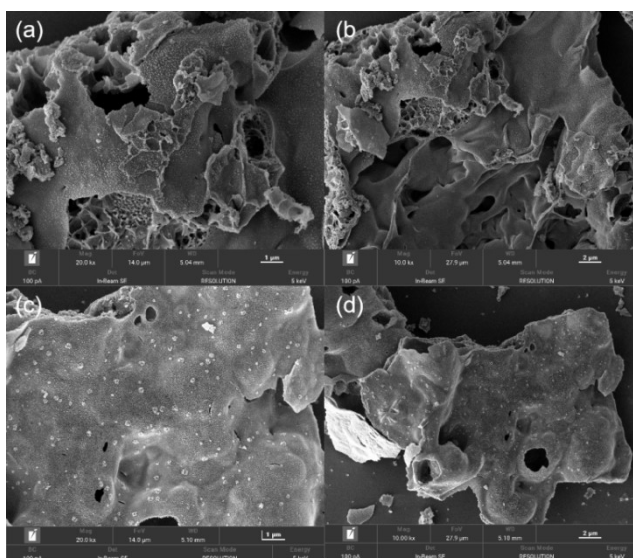
Figure S1. XRD patterns of the different solid catalysts

Table S1. The BET surface area and pore size of different catalysts

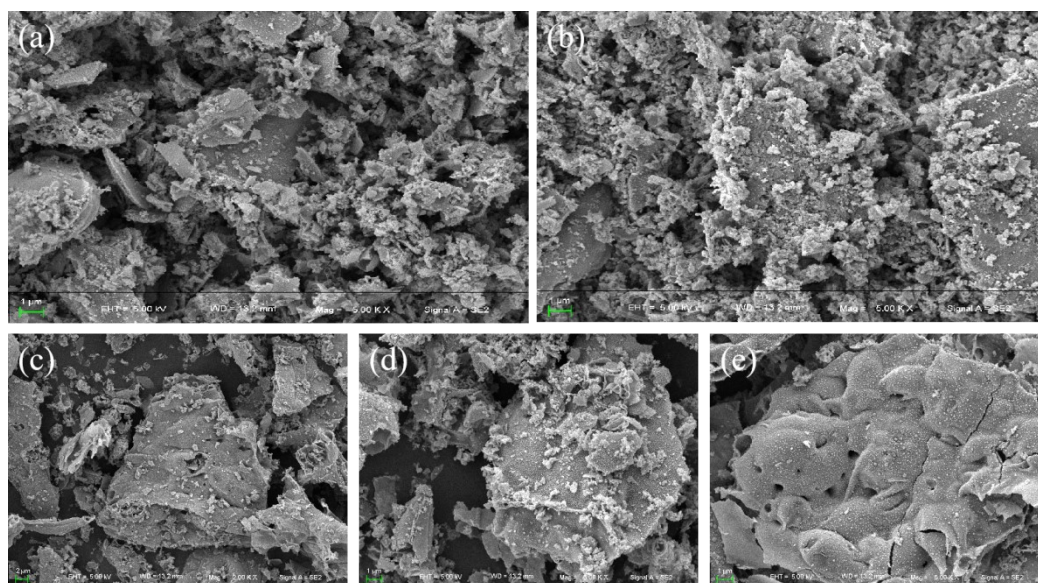
Catalyst	BET Surface area (m <sup>2</sup> •g <sup>-1</sup> ) 1)	Pore volume (cm <sup>3</sup> •g <sup>-1</sup> )	Average pore diameter(Å)
CuCoAlNiFeO <sub>x</sub>	66.78	0.1217	42.21
CuCoAlNiFe-250R	46.43	0.1005	44.22
CuCoAlNiFe-350R	47.95	0.1071	45.91
CuCoAlNiFe-450R	57.56	0.1211	49.56
CuCoAlNiFe-550R	37.43	0.09303	51.82



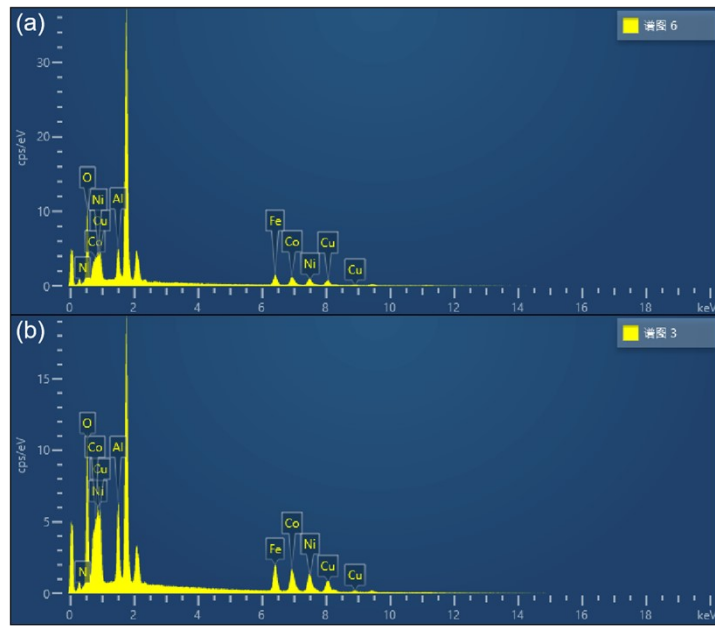
**Figure S2.** The N<sub>2</sub> adsorption-desorption isotherm and pore size distribution of CuCoAlNiFeO<sub>x</sub> (left) and CuCoAlNiFe-250R (right)



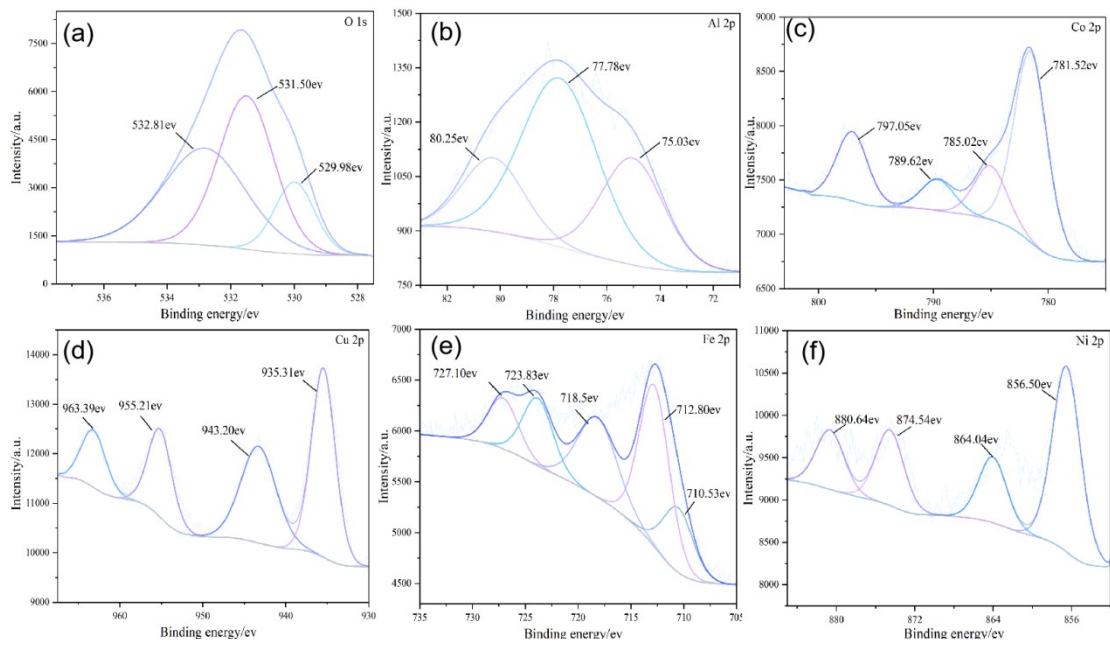
**Figure S3.** The SEM images of the CuCoAlNiFeO<sub>x</sub> catalyst (a, b) and CuCoAlNiFe-250R catalyst (c, d)



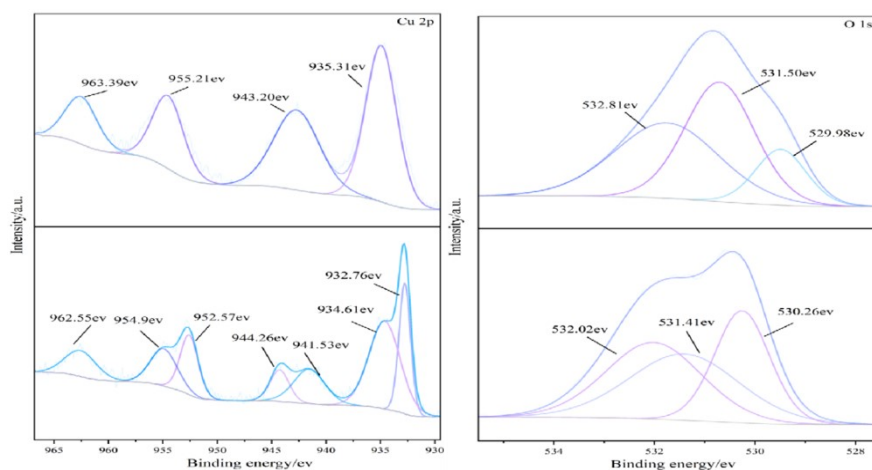
**Figure S4.** The SEM images of CuCoAlNiFe-250R (a), CuCoAlNiFe-350R (b), CuCoAlNiFe-450R (c), CuCoAlNiFe-550R (d), and CuCoAlNiFe-650R (e)



**Figure S5.** EDX results of CuCoAlNiFeO<sub>x</sub> catalyst (a) and the CuCoAlNiFe-250R catalyst (b)



**Figure S6.** The XPS spectra of the O, Al, Co, Cu, Fe or Ni element in CuCoAlNiFeO<sub>x</sub> catalyst

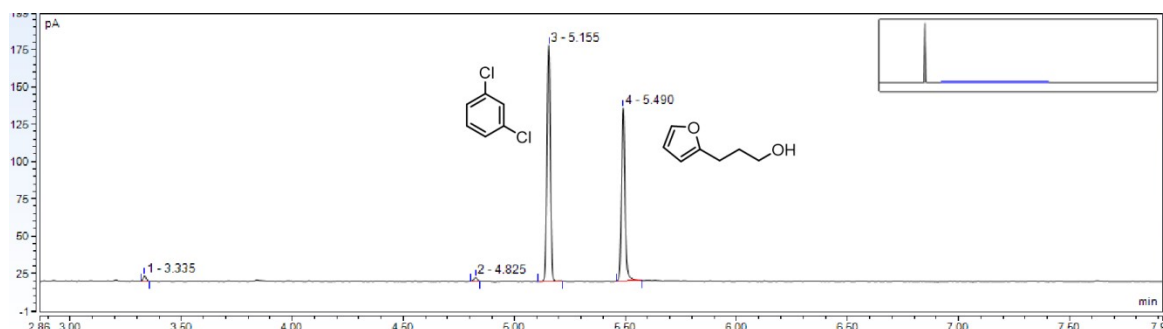


**Figure S7.** The XPS spectra of O 1s and Cu 2p of CuCoAlNiFeO<sub>x</sub> catalyst and the CuCoAlNiFe-250R catalyst

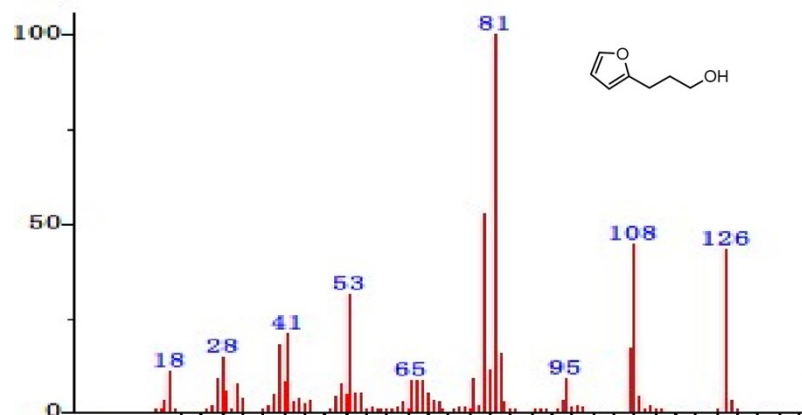
### 3. The used analysis conditions and the obtained GC spectra of products

The analysis condition of gas chromatography with a FID detector is presented as follows: The used capillary column is HP-5MS column (30m×0.25mm×0.25μm); Detector temperature: 250 °C; Injection temperature: 220 °C; Carrier gas: N<sub>2</sub> with the 1.0 mL/min of rate.

In addition, the qualitative analyses of products were conducted with the Agilent 6890/5973 GC-MS equipped with the HP-5MS capillary column.



**Figure S8.** The GC spectrum for the reaction of furan-2-acrolein using the CuCoAlNiFeO<sub>x</sub> solid catalyst



**Figure S9.** The GC-MS data for the reaction of furan-2-acrolein with the CuCoAlNiFeO<sub>x</sub> catalyst

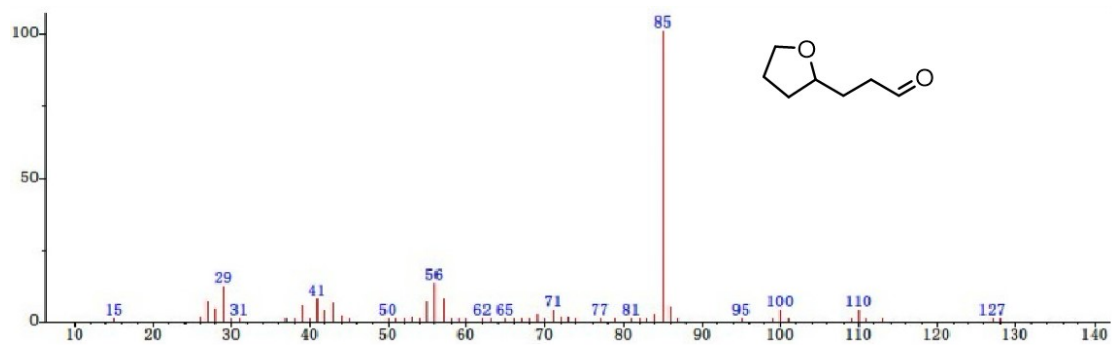
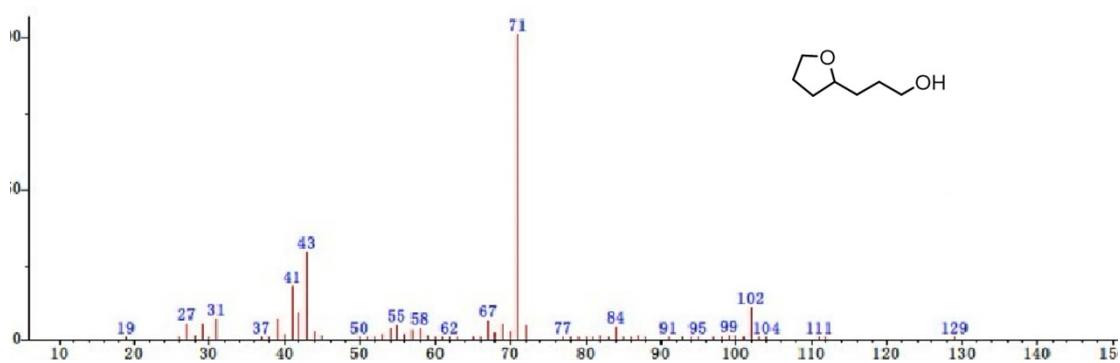
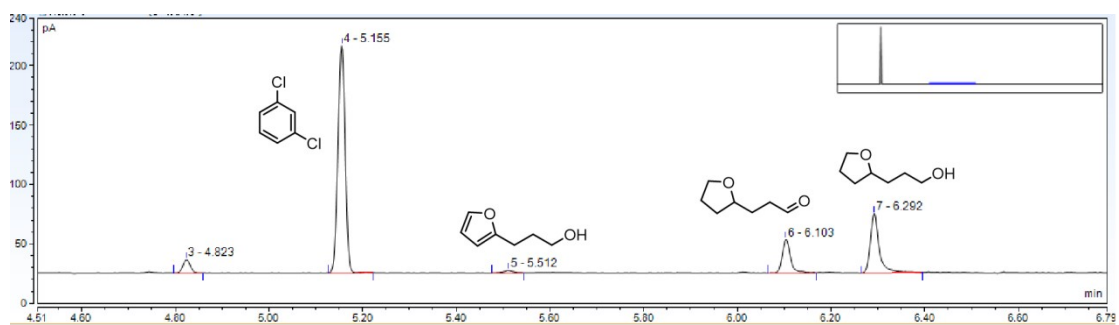


Figure S10. GC spectrum and GC-MS result for the reaction of furan-2-acrolein with CuCoAlNiFe-250R catalyst