- Supplementary Information –

Toward an Intensified Process of Biomass-Derived Monomers:

The Influence of 5-(Hydroxymethyl)furfural Byproducts on the Gold-Catalyzed Synthesis of

2,5-Furandicarboxylic Acid

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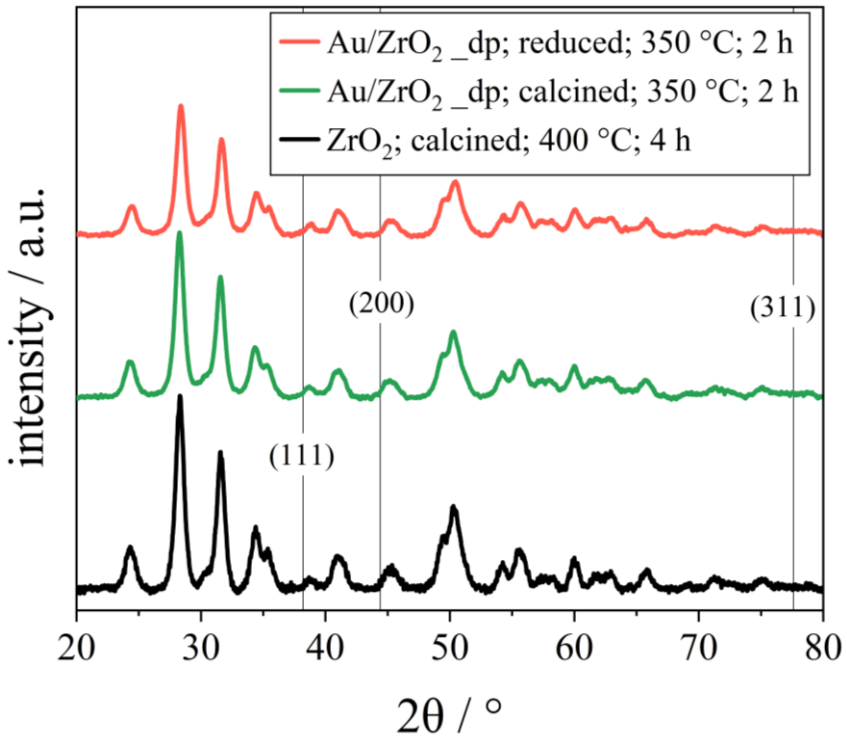

Figure S 1. XRD patterns of Au/ZrO_2 catalysts via deposition-precipitation (dp) in reduced, calcined state and of ZrO_2 support.

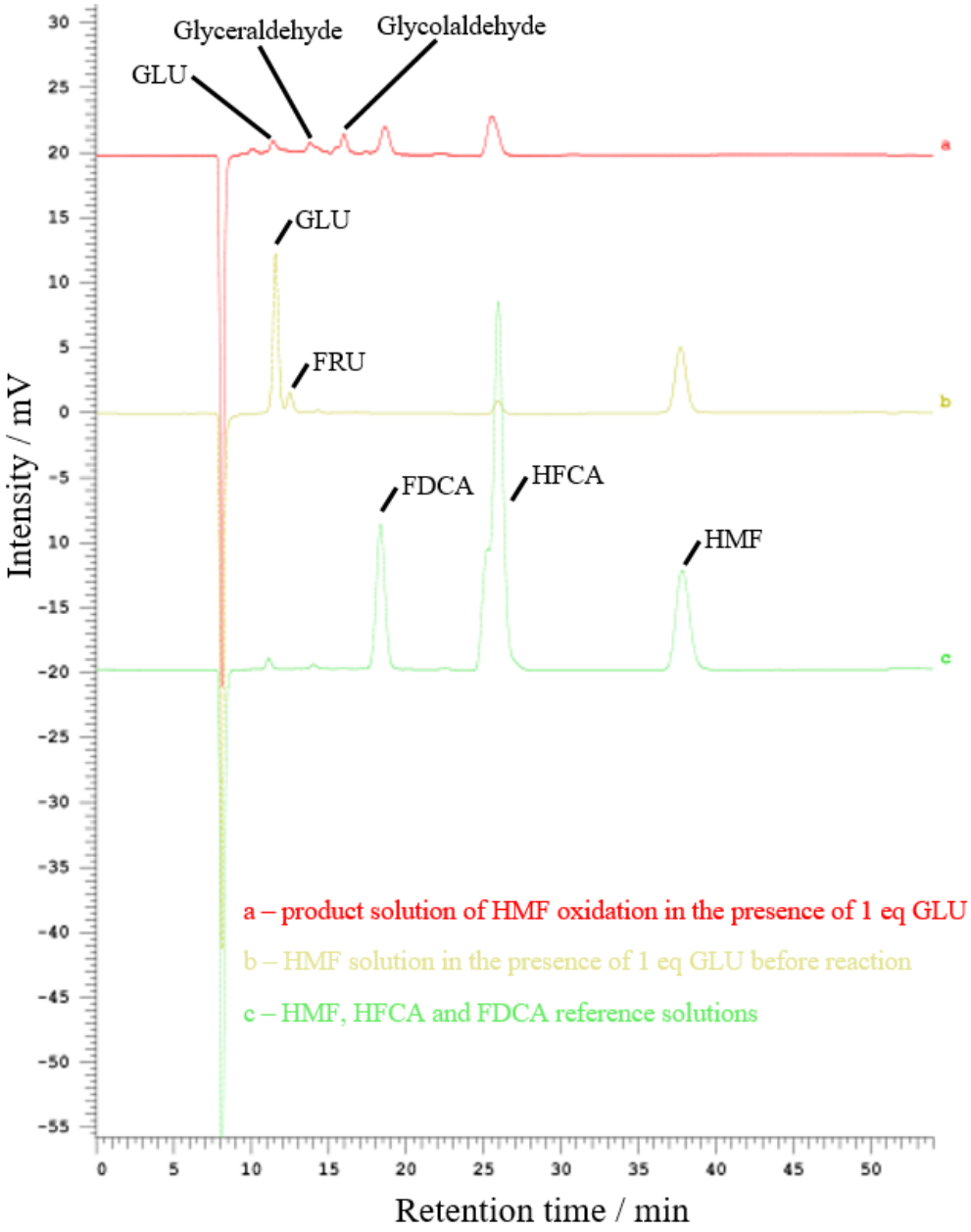

Figure S 2. Representative HPLC chromatograms of a reference solution and HMF solution before and after the reaction in the presence of 1 eq. of GLU. Reaction conditions: 100 °C, 4 eq. of NaOH, 10 bar air, 5 h, 98.5 mg of catalyst, 0.1 M HMF in 10 mL.

The degradation of GLU under the chosen reaction conditions is mostly unselective and probably gives mostly humins,[1-3] as calibrated degradation products are only observed in low concentrations (Figure S 2).

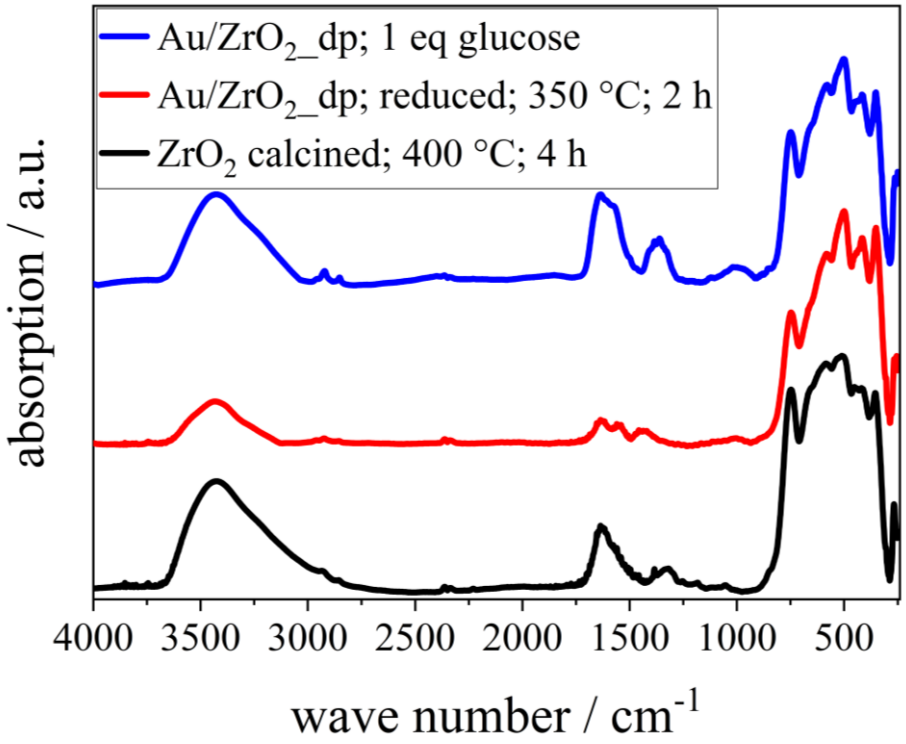

Figure S 3. Normalized IR absorption spectra of recovered Au/ZrO_2 after the reaction in the presence of 1 eq. GLU. Spectra of the calcined ZrO_2 support and the fresh catalyst are given for comparison.

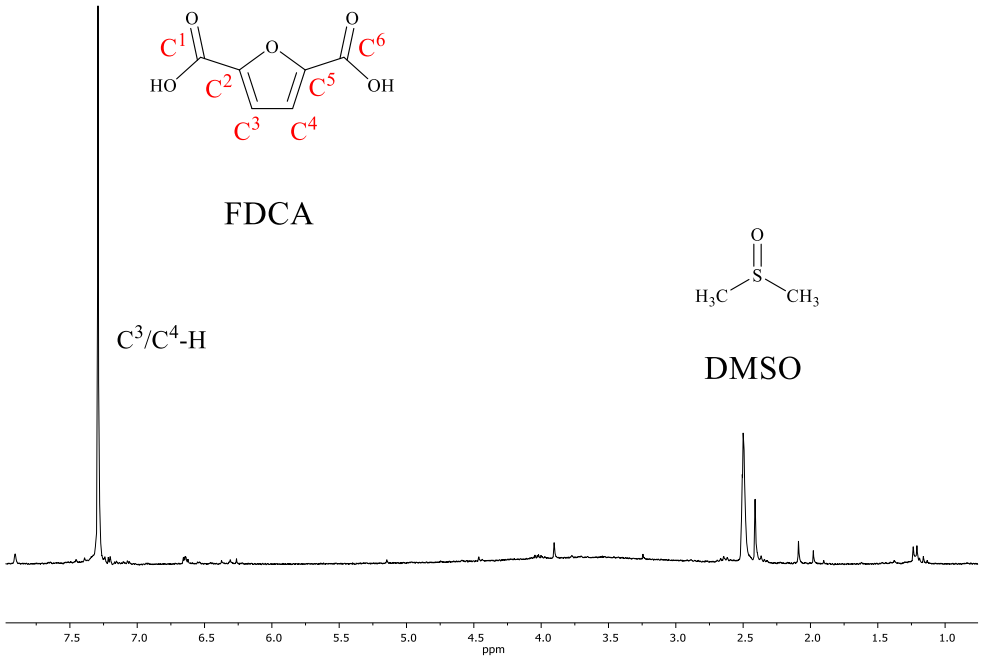

Figure S 4. ^1H NMR spectrum (250 MHz, DMSO-d_6, δ = 2.5 ppm, 298 K) of extracted FDCA: 7.3 ppm (s, 2 H, C^3/C^4-H).

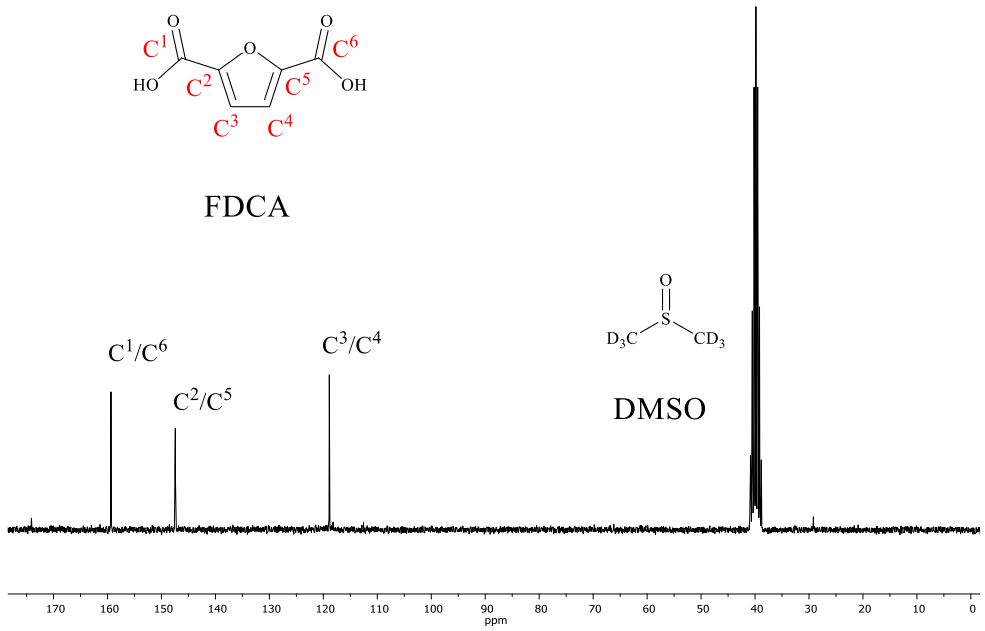

Figure S 5. ^{13}C NMR spectrum (63 MHz, DMSO-d_6, δ = 39 .8 ppm, 298 K) of extracted FDCA: 118.5 ppm (2 C, C^3/C^4), 147.1 ppm (2 C, C^2/C^5), 159.0 ppm (2 C, C^1/C^6).

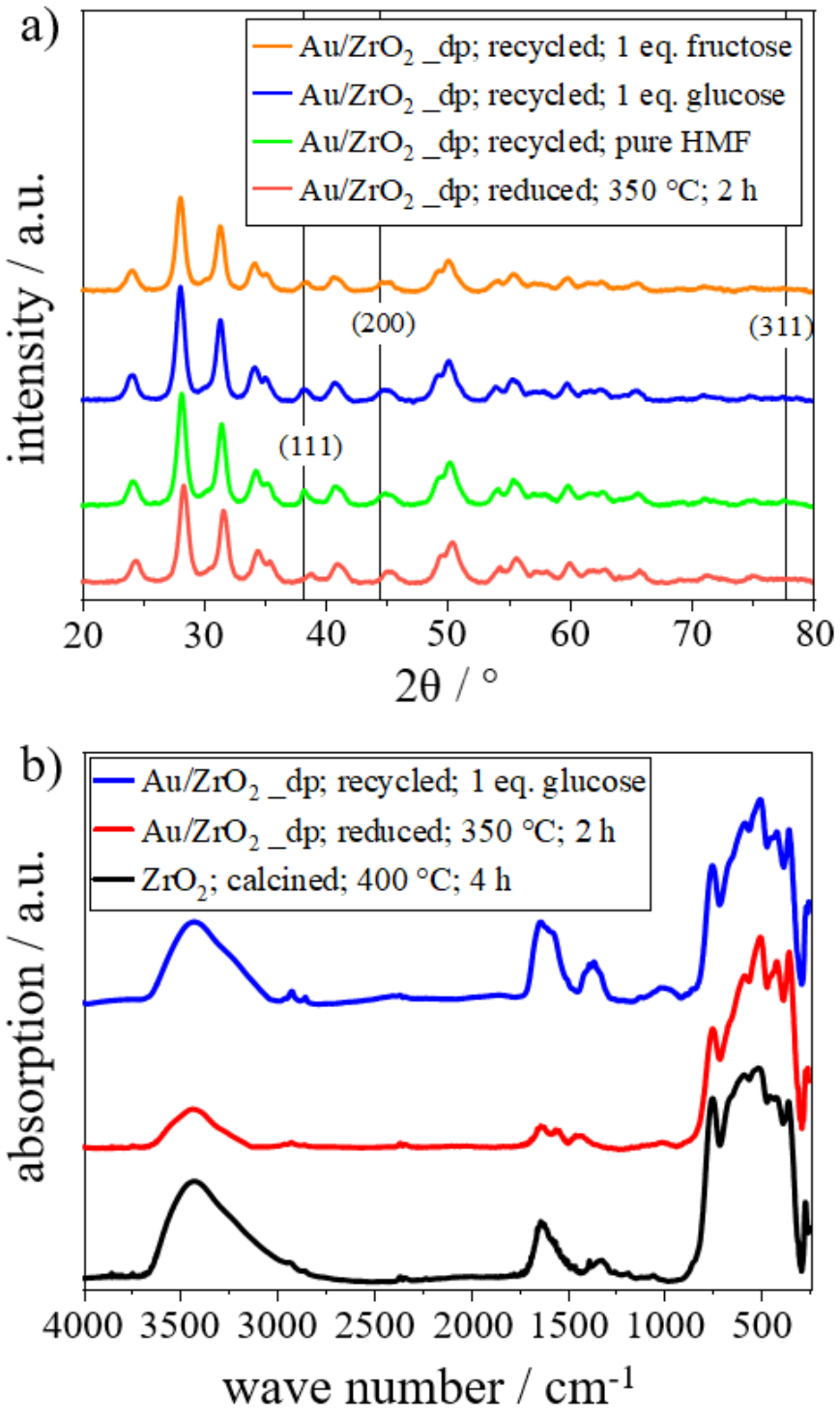

Figure S 6. Catalyst characterization (a) XRD patterns of recovered Au/ZrO_2 after the third run without by-products, added sugars and in reduced state. (b) Normalized IR spectra of recovered Au/ZrO_2 catalysts after third run in the presence of GLU, in reduced state and calcined ZrO_2 support.

The increased absorbance in the IR spectrum of the spent Au/ZrO_2 catalyst in the presence of GLU at around 1370 cm^{-1} may be attributed to the deposition of humins on the catalyst surface.[4]

References

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