Electronic Supplementary Material (ESI) for Green Chemistry.
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Supporting Information For

Continuous Catalytic Upgrading of Ethanol to n-Butanol and >C_4 Products over Cu/CeO_2 Catalysts in Supercritical CO_2

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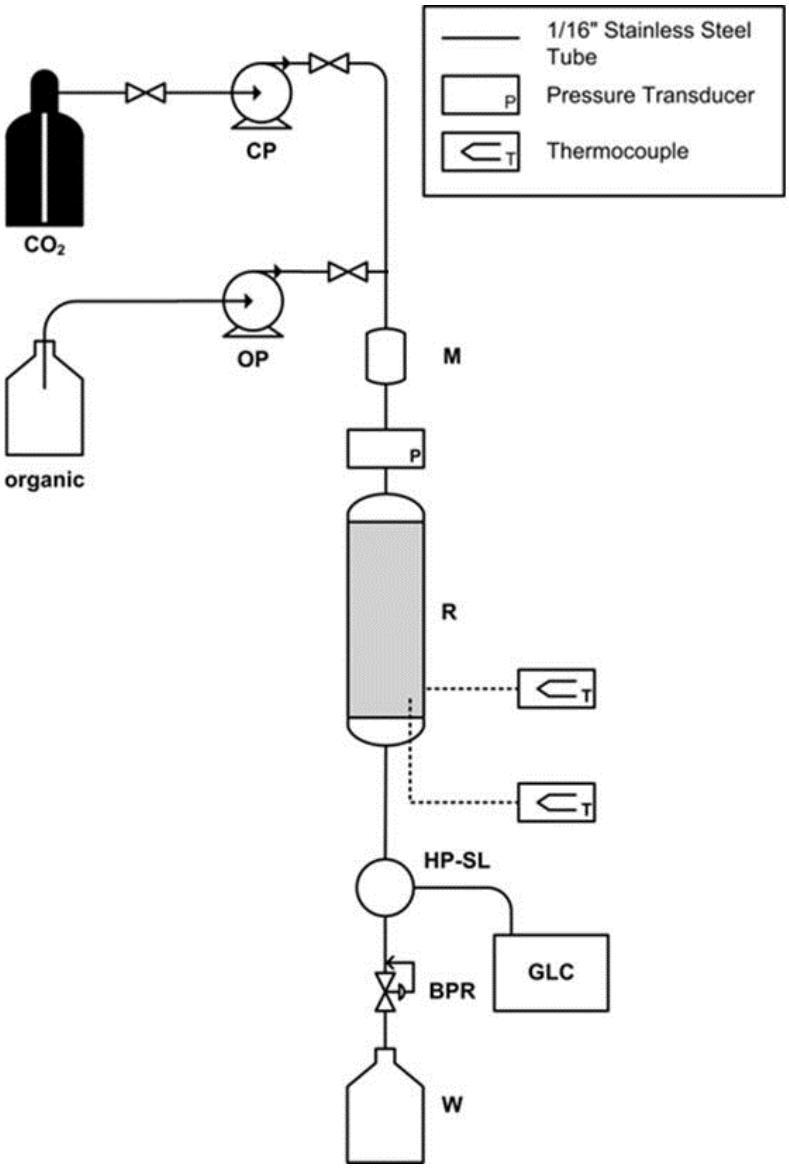

Figure S1. Schematic of flow reactor used for supercritical carbon dioxide reactions. The components are labelled as follows: CP, chilled CO_2 pump; M, mixer; OP, organic pump; PH, preheater and mixer; R, ¼ inch sand packed reactor containing Cu catalyst; HP-SL, high pressure sample loop; BPR, back pressure regulator; GLC, gas liquid chromatograph; W, organic waste.

All experiments were carried out using a high pressure, automated continuous flow reactor with on-line GC analysis. The reactor, described in detail previously is designed to record the effect on product yield of varying one reaction parameter (e.g. temperature, pressure, flow rate, etc) at a time.

In a typical experiment, a tubular reactor (156 mm long × 3.525 mm internal diameter) was filled with catalyst and Swageloked into the apparatus. The catalysts were then reduced for 1 hour in a 5 % H_2/N_2 stream at 200 °C. After this, the reactor was cooled to 150 °C, the system pressure was set via the back pressure regulator, and the organic and CO_2 flows initiated. For all experiments, the flow rates were 1 mL/min CO_2 and 0.05 mL/min EtOH and the temperature ramp was 150–350 °C at 0.3 °C/min.

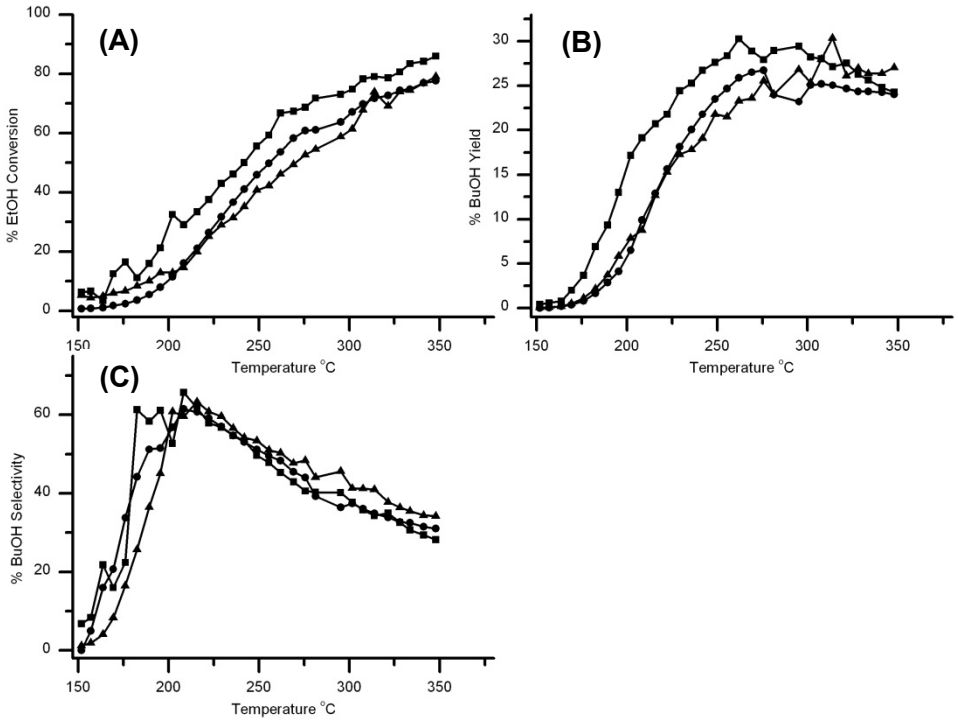

Figure S2 **(A)** EtOH conversion **(B)** BuOH yield **(C)** BuOH selectivity at different system pressures **▲ 70 bar**, **■ 100bar** and **● 180 bar** over $Cu/HSACeO_2$ in $scCO_2$. System pressure has had little effect on the activity of the catalyst. Reaction conditions were as follows; 0.05 mL/ min EtOH, 1 mL/min CO_2, 100 bar system pressure and temperature 150-350 °C at 0.3 °C/min.