

Supporting Information

1. NMR Spectra

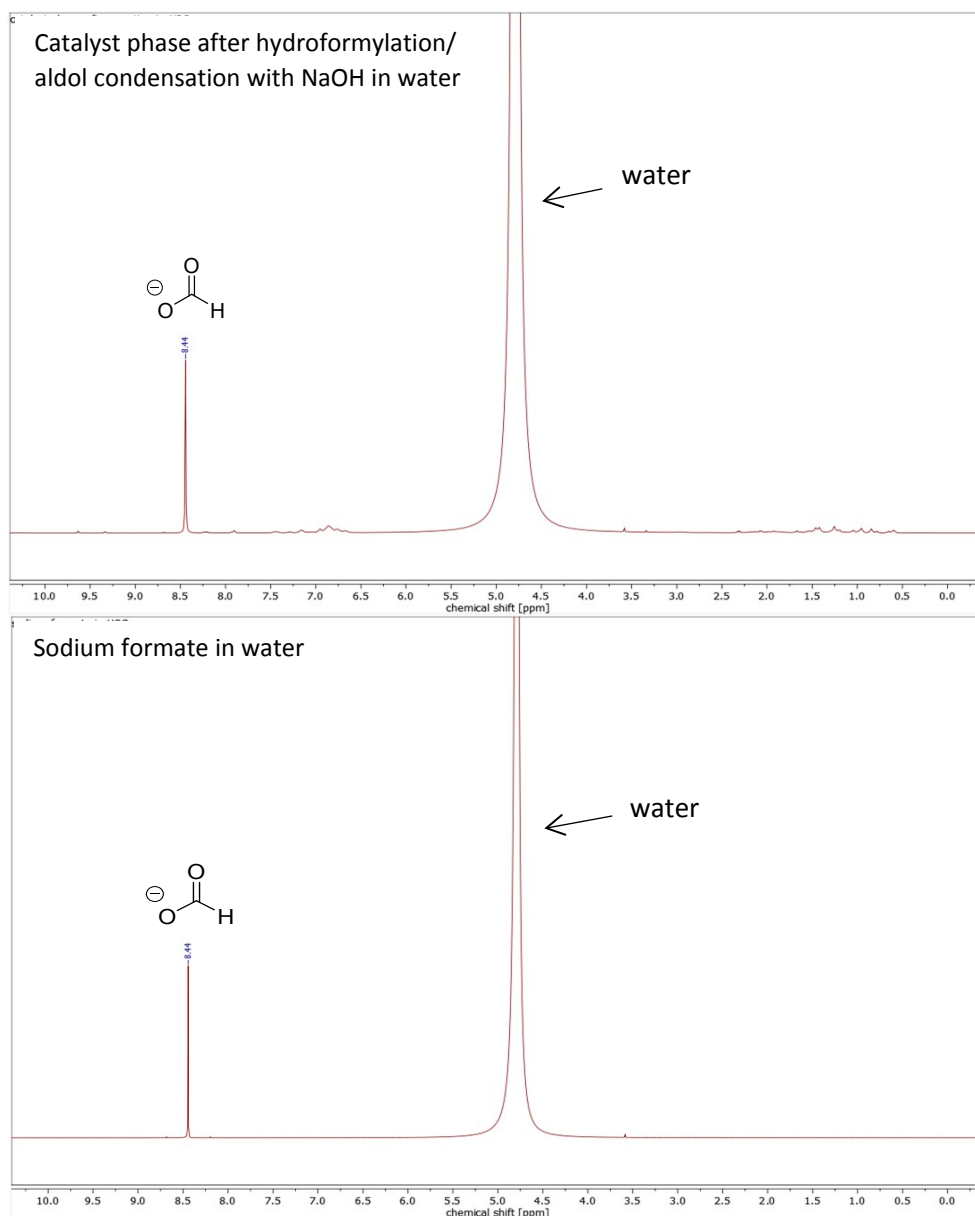


Fig. S1: ^1H -NMR spectrum of the catalyst phase after the hydroformylation/aldol condensation reaction in water (top) and reference spectrum of sodium formate in water (bottom). Both measured in D_2O .

1.1. Reaction of NaOH to sodium formate in H_2O and PEG-200

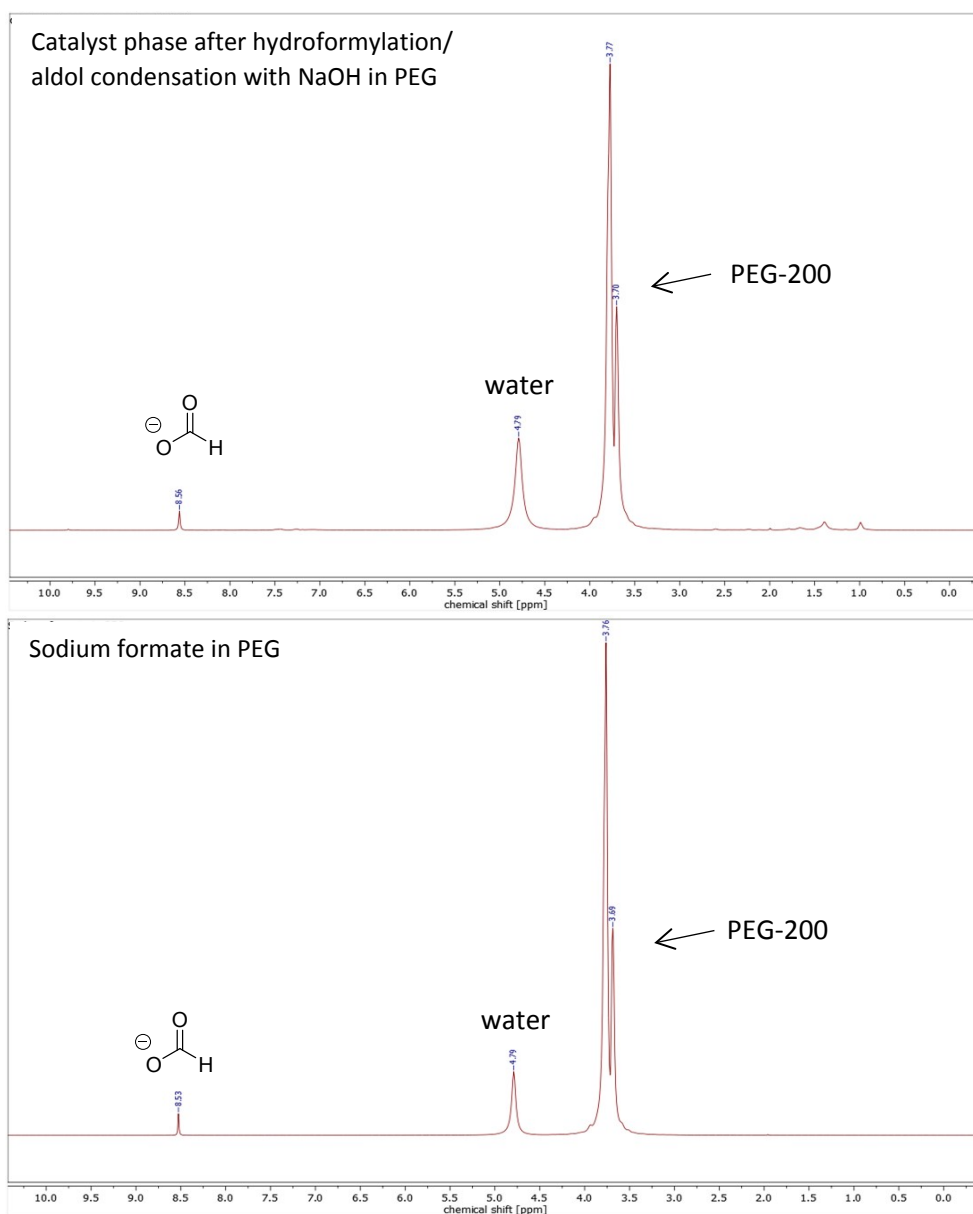


Fig. S2: ^1H -NMR spectrum of the catalyst phase after the hydroformylation/aldol condensation reaction in water (top) and reference spectrum of sodium formate in PEG-200 (bottom). Both measured in D_2O .

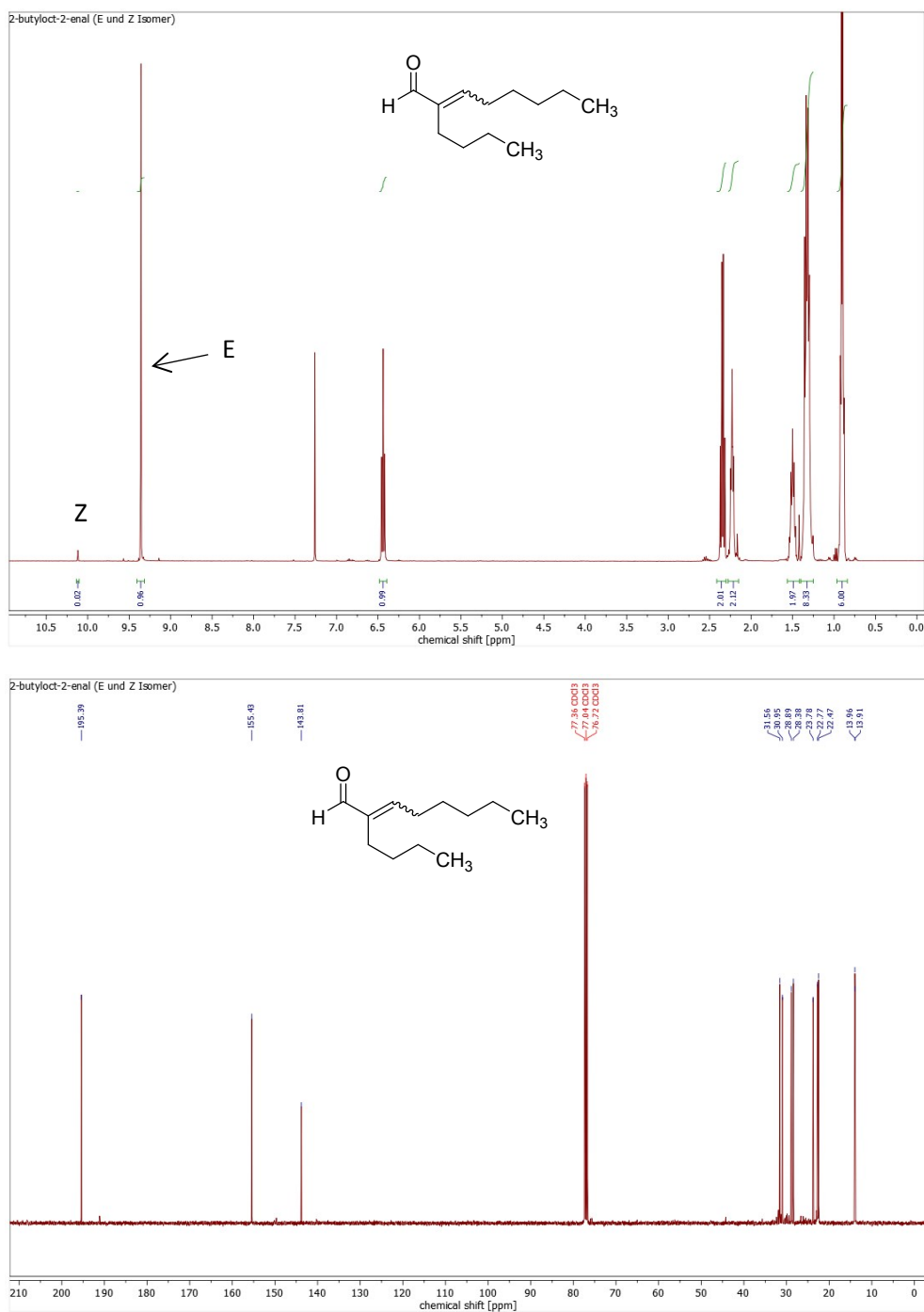


Fig. S3: ^1H -NMR (top) and ^{13}C -NMR spectrum (bottom) of 2-butyloct-2-enal in CDCl_3 . Ca. 98% E-isomer.

1.2. Isolated 2-butyloct-2-enal (C_{12} -Aldol)

2. Recycling Experiment with L-tryptophan as aldol catalyst

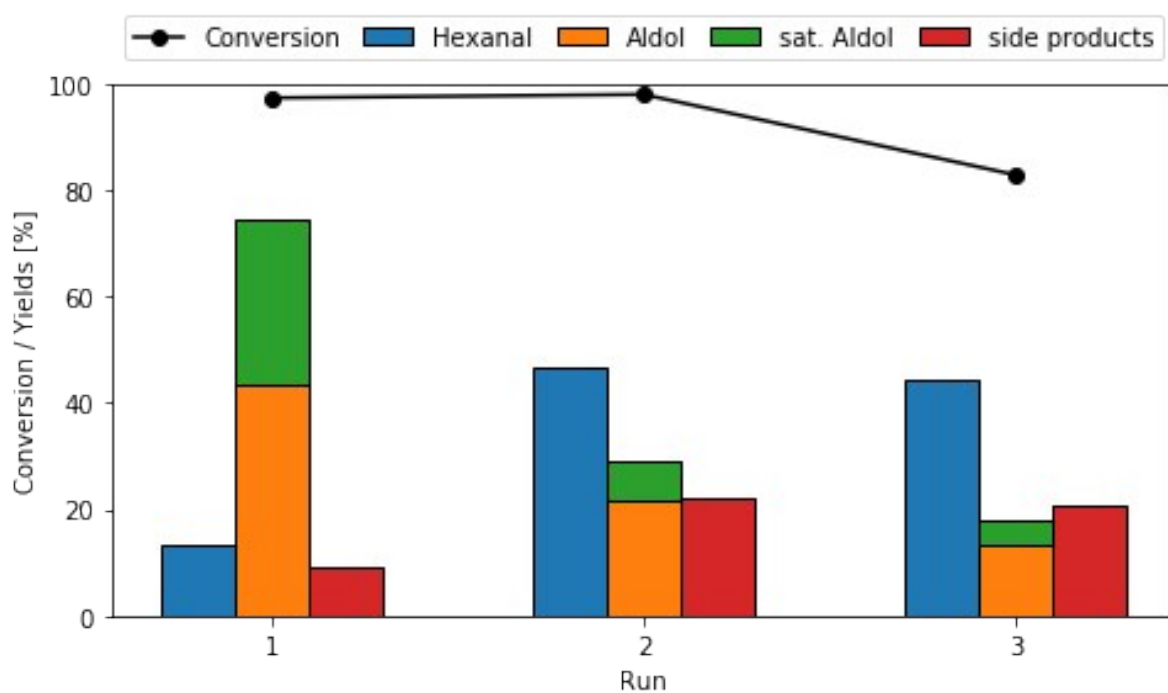


Fig. S4: Recycling experiment of the hydroformylation/aldol condensation of 1-pentene in PEG-200 with *L*-tryptophan. Conditions: Pentene (8.2 mmol, 0.9 mL), PEG-200 (0.4 mL), $[\text{Rh}(\text{acac})(\text{CO})_2]$ (0.1 mol%), sulfoXantphos (0.2 mol%), tryptophan (5 mol%), H_2/CO (25 bar each), 100 °C, 16 h. Side products include pentane and alcohols.