

Integrated Conversion of 1-butanol to 1,3-Butadiene

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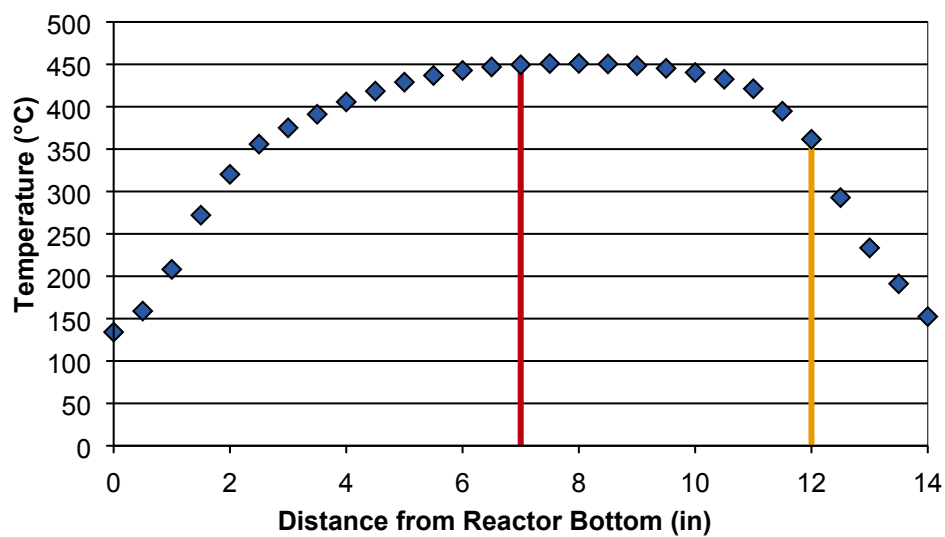


Figure S1. Temperature profile in dehydration-dehydrogenation reactor, including position of $\text{K-Cr}_2\text{O}_3/\text{Al}_2\text{O}_3$ (red) and $\gamma\text{-Al}_2\text{O}_3$ (yellow) catalyst beds.

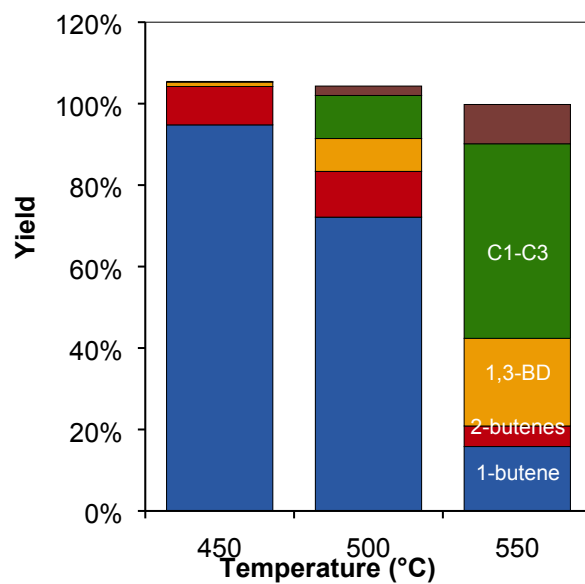


Figure S2. Control reaction of butene through SiO_2 -packed reactor tube. Conditions: 100 sccm 5.4 mol% 1-butene in N_2 .

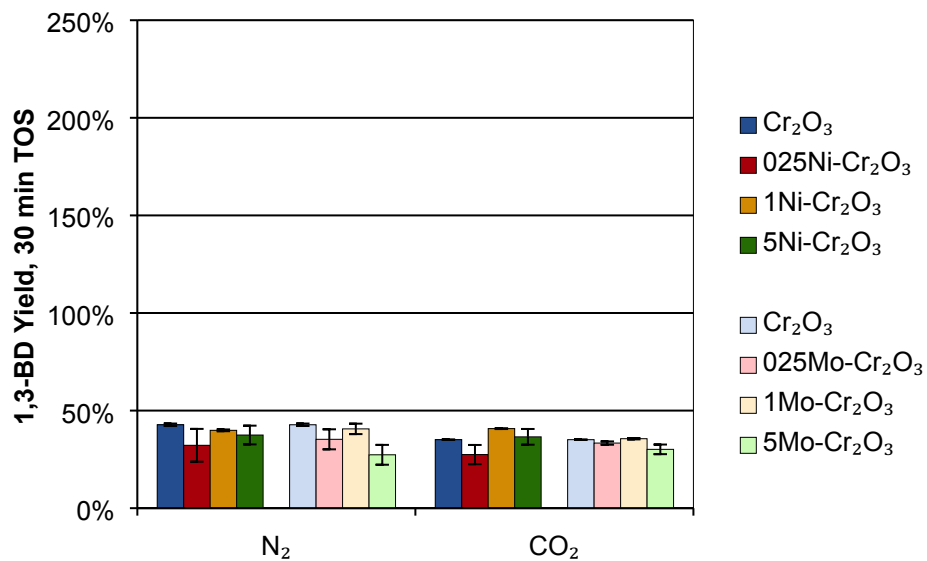


Figure S3. Single-pass butadiene yields over Ni- and Mo-doped $\text{Cr}_2\text{O}_3/\text{Al}_2\text{O}_3$ catalysts at different dopant loadings and 30 min time-on-stream.

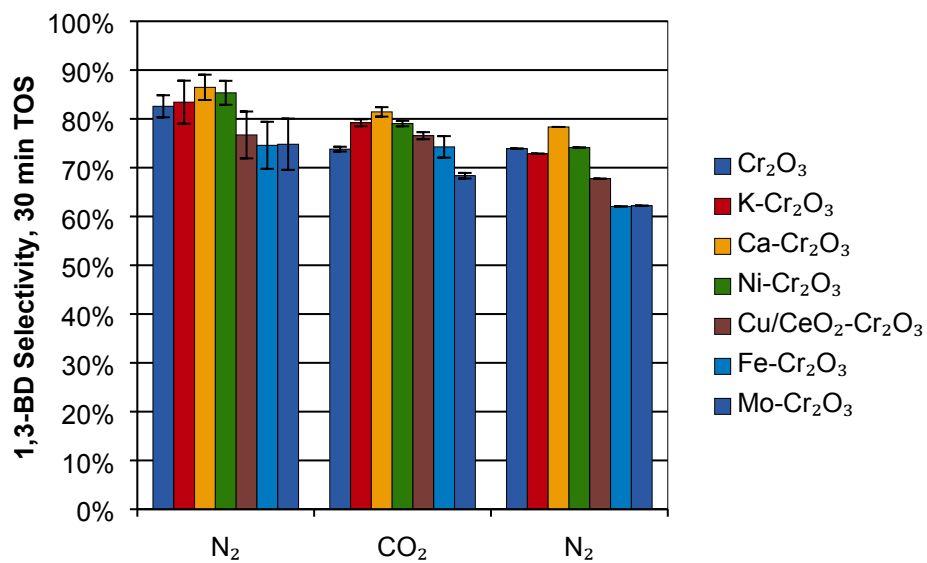


Figure S4. Selectivity to 1,3-Butadiene over 1 wt% doped $\text{Cr}_2\text{O}_3/\text{Al}_2\text{O}_3$ catalysts at 30 min time-on-stream.

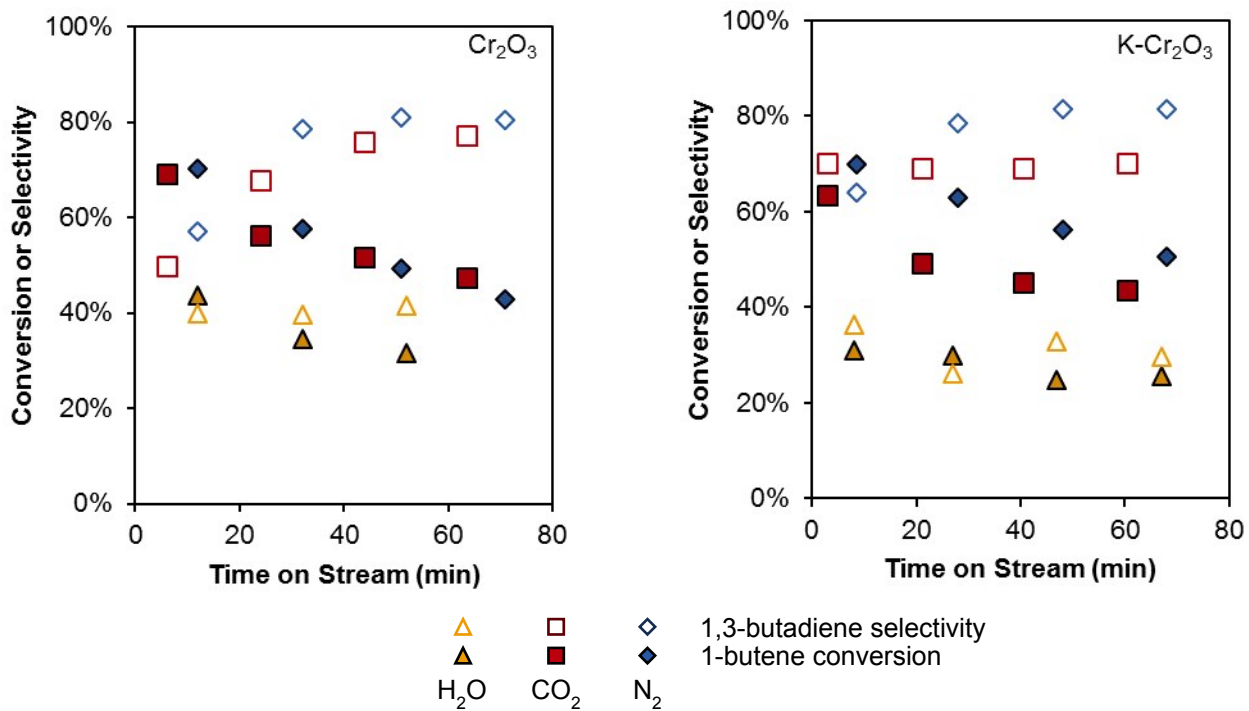


Figure S5. Activity comparison of $\text{Cr}_2\text{O}_3/\text{Al}_2\text{O}_3$ and $\text{K-Cr}_2\text{O}_3/\text{Al}_2\text{O}_3$ catalyst in N_2 , with 50% N_2 , CO_2 , and H_2O co-feeds.

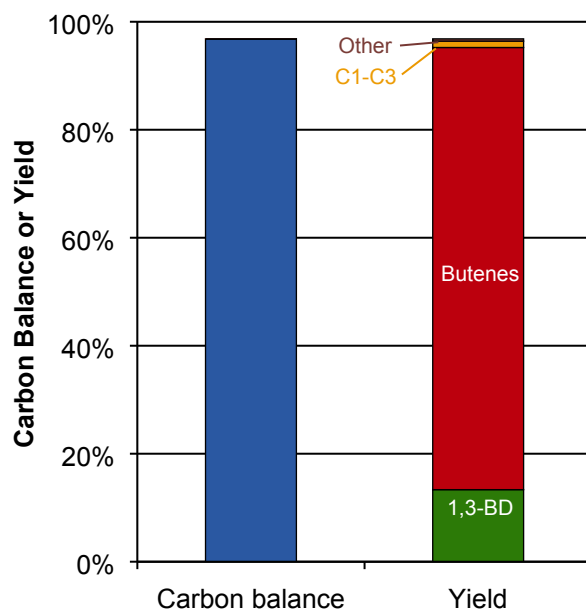


Figure S6. Average carbon balance and yield to various product classes in integrated conversion of butanol to 1,3-butadiene over 10 h TOS.

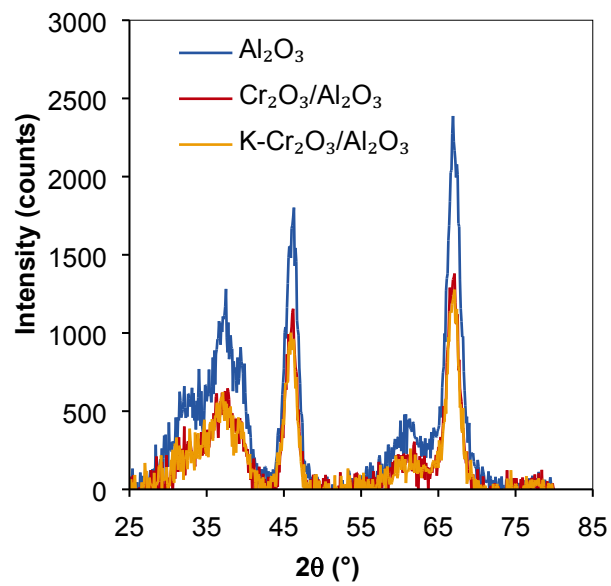


Figure S7. XRD diffractograms for catalysts synthesized in this work.