

## Reactivity and Kinetic studies of Hydrodeoxygenation of Benzofuran on Novel CoPdP Catalysts Supported on Potassium Ion Exchanged Ultra-Stable Y-Zeolites

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The synthesis of CoPd(X:Y)P supported on potassium ion exchanged ultra-stable Y (KUSY) zeolites was studied and catalytic activity tests on the hydrodeoxygenation of a model pyrolysis oil compound, benzofuran, was conducted. The catalyst structure was probed by X-ray diffraction (XRD) and extended X-ray adsorption fine structure (EXAFS), revealing the formation of the CoPdP alloy. Synergistic effects were observed between Co and Pd, with CoPd(9:1)P/KUSY performing the best, obtaining 99% conversion and 37% deoxygenate selectivity at 350 °C. Contact-time study was used to probe the mechanism of benzofuran deoxygenation on CoPd(9:1)P/KUSY. Multiple reaction networks were examined. The best fit was obtained when adsorbed intermediate species were accounted for in the catalytic rake mechanism. The main reaction pathway for HDO of benzofuran involves the direct deoxygenation of 2-ethylphenol to form ethylbenzene, which was also shown to be the rate determining step. Strong equilibrium between 2-ethylphenol and 2,3-dihydrobenzofuran, primary and secondary components, was observed.