

### Catalytic conversion of biomass-derived butanal into fuel-grade compounds over Pd supported catalysts

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The catalytic conversion of butanal over Pd catalyst supported on different metal oxides catalysts was carried out for the production of gasoline-range branched hydrocarbon via condensation and hydrodeoxygenation (HDO). The catalysis of butanal over Pd supported catalysts was mainly divided into 4 reaction routes as catalytic properties: Route 1) decarbonylation and dehydrogenation, Route 2) coupling via ketonization, aldol-condensation and esterification, Route 3) hydrodeoxygenation with C-C bond cleavage and Route 4) isomerization. Among the prepared catalysts, Pd/ZrO<sub>2</sub> showed the complete butanal conversion with the formation of C<sub>7</sub>-to-C<sub>9</sub> branched hydrocarbon (75% yield). Additionally, the ratios of O/C and straight-chain to branched hydrocarbon (n-C/br-C) were found to be 0.005 and 0.17, respectively. This indicates that an adequate combination of Pd dispersion and amphoteric ZrO<sub>2</sub> character promoted hydrodeoxygenation, C-C coupling and isomerization reactions. Consequently, both Pd dispersion and acid-base properties of supports are suggested to play a pivotal role in producing gasoline-range hydrocarbon at a high yield.