Effects of Alkali and Counter Ions in Sn-Beta Catalyzed Carbohydrate Conversion - DTU Orbit (12/01/2019)

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Alkali ions have been shown to strongly influence the catalytic behavior of stannosilicates in the conversion of carbohydrates. An effect of having alkali ions present is a pronounced increase in selectivity towards methyl lactate. Mechanistic details of this effect have remained obscure and are herein addressed experimentally through kinetic experiments and isotope tracking. Alkali ions have a differential effect in competing reaction pathways: they promote the rate of carbon-carbon bond breakage of carbohydrate substrates, but decrease the rates of competing dehydration pathways. Further addition of alkali inhibits activity of Sn-Beta in all major reaction pathways. The alkali effects on product distributions and on rates of product formation are similar, thus pointing to a kinetic reaction control and to irreversible reaction steps in the main pathways. Additionally, an effect of the accompanying basic anions is shown, supposedly facilitating the cation exchange and eliciting a different concentration-dependent effect than neutral alkali salts.

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