

Supplementary Materials: Improvement of the Catalytic Efficiency of Butene Oligomerization Using Alkali Metal Hydroxide-Modified Hierarchical ZSM-5 Catalysts

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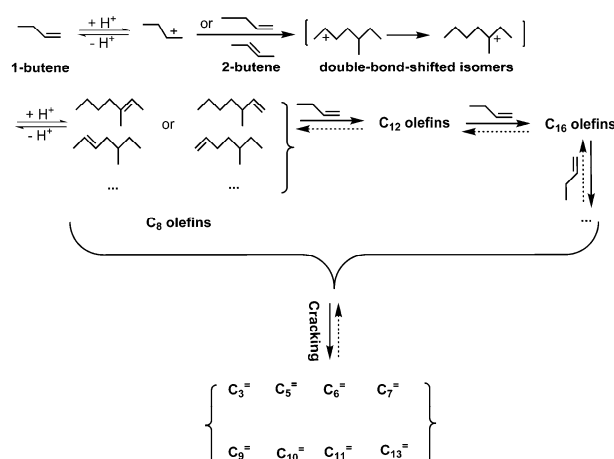


Figure S1 Major reaction mechanism for oligomerization of butene.

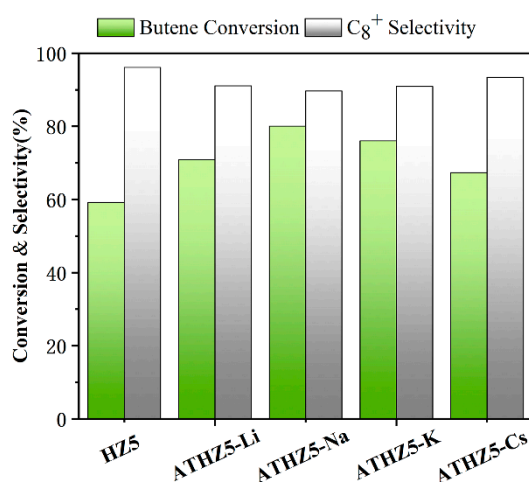


Figure S2. Conversion and C_8^+ selectivity of catalytic oligomerization of HZ5 catalyst and hierarchical catalysts. Reaction condition: temperature 473 K, pressure 1.5 Pa, time 2 h.

The analysis of butene conversion and C_8^+ selectivity were estimated by time on stream of 2 h at 473 K under 1.5 MPa and a WHSV of 6 h⁻¹. It was observed that alkali treatment with LiOH, NaOH, KOH, and CsOH significantly promoted the generation of liquid hydrocarbons. For the five catalysts, butene conversion gradually increased linearly in the order ATHZ5-Na > ATHZ5-K > ATHZ5-Li > ATHZ5-Cs > HZ5 and then slightly decreased (Figure S2). The acid site content showed the same trend, which indicated that acidity is important for the oligomerization reaction. Conversely, the C_8^+ selectivity slightly decreased with a corresponding increase in butene conversion. This can be attributed to the increase in the amount of acid site, which not only improved the activity of oligomerization of butene,

but also led to the generation of by-products such as light hydrocarbons. Above all, the ATHZ5-Cs catalyst with higher L/B ratio and lower total acid sites, exhibited a higher catalytic selectivity than that of the other modified catalysts.