

## Impact of Activation Temperature on Product Selectivity in Isobutane / 2-Butene Alkylation over Zeolites

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### Abstract

Alkylation of isobutane with light olefins is an important refining process for the production of alkanes with high octane number, which are an ideal blending component for gasoline. The present commercial alkylation technology using sulfuric acid and hydrofluoric acid suffers from drawbacks such as corrosiveness and handling hazards. A process using solid acid catalysts has potential advantages for simplifying product handling as well as reducing environmental and health risks. Zeolites, in particular lanthanum exchanged FAU are promising candidates. [1] The lifetime and selectivity of these catalysts are highly dependent on the ratio between alkylation and oligomerization rate. The selectivity of 2,2,4-Trimethylpentane is a good indicator for the hydride transfer rate because its formation rate largely depends on the so called self-alkylation pathway of isobutene with isobutane, in which the isobutene is formed via hydride transfer from isobutane to protonated 2-butene. [2] In this work, we change the content of residual water on the zeolite by varying the activation temperature and study its influence on the hydride transfer rate indicated by 2,2,4-TMP selectivity in isobutane/cis-2-butene alkylation. The results showed that lowering the amount of water present after activation procedure leads to an increase of self-alkylation products corresponding to a higher hydride transfer rate.

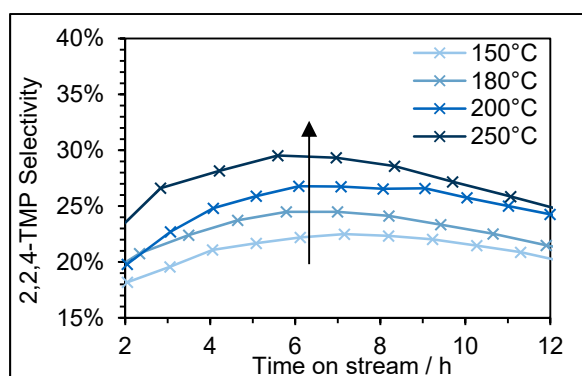


Figure 1: Dependence of 2,2,4-TMP selectivity on activation temperature:

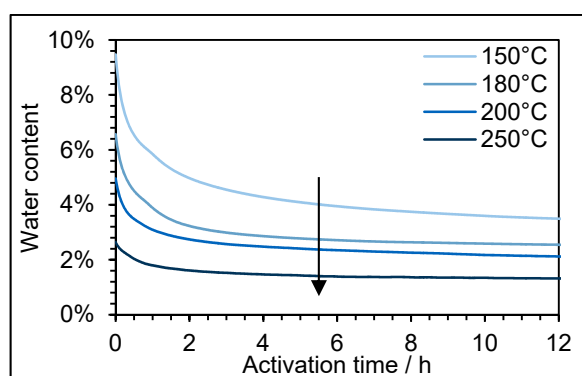


Figure 2: Correlation between water content and activation temperature.

### References:

- [1] A. Feller, I. Zuazo, A. Guzman, J. O. Barth, J. A. Lercher, *Journal of Catalysis* **2003**, 216, 313-323.
- [2] F. Schüßler, S. Schallmoser, H. Shi, G. L. Haller, E. Ember, J. A. Lercher, *ACS Catalysis* **2014**, 4, 1743-1752.