

## Identification of active sites for the dimerization of pinenes on the solid acid catalysts

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Pinene extracted from biomass can be converted to its dimers which are potential high density energy sources. We focused on the dimerization of pinenes using zirconia and sulfated zirconia. Zirconium oxide was synthesized using simple sol-gel method and then treated with sulfuric acid. The acid sites on the catalysts were characterized using N<sub>2</sub>-physisorption, NH<sub>3</sub>-TPD, and pyridine-FT-IR. The catalysis was performed, which was analyzed based on the acid sites on the catalysts. The products were measured using GC-FID, GC/MS, and GPC. The origin of catalytic activity was studied and the strategy to improve the catalytic activity was discussed.