Enhancing the Catalytic Activity Utilizing Strong Metal-Support Interactions (SMSI) - Isomerization of Alkenes on Substituted Hydroxyapatite Supported Gold Catalysts

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A thin layer of hydroxyapatite (HAP) covers surfaces of gold nanoparticles (Au NPs) by heat treatment in an oxidative atmosphere, which is the so-called oxidative SMSI.[1] The oxidative SMSI makes Au positively charged, which is beneficial to use Au as a soft Lewis acid catalyst. In this work, we exploited apatite-supported Au catalysts with oxidative SMSI for π-activation reaction of an alkene. The cationic property of Au was carefully analyzed by diffuse reflectance FT-IR studies of the CO adsorption (CO-DRIFT). The Au-CO peak shifted to a higher wavenumber by partial substitutions of Ca or Sr with Mg and Ce, and by a formation of the oxidative SMSI, meaning that Au NPs became more cationic. The catalytic activity for isomerization of 3,4-diacetoxybut-1-ene (34DABE) to 14DABE was correlated well to the cationic properties of Au (Figure 1). Precise control of the oxidative SMSI enhanced soft Lewis acidity of Au, resulting in improved catalytic activity.

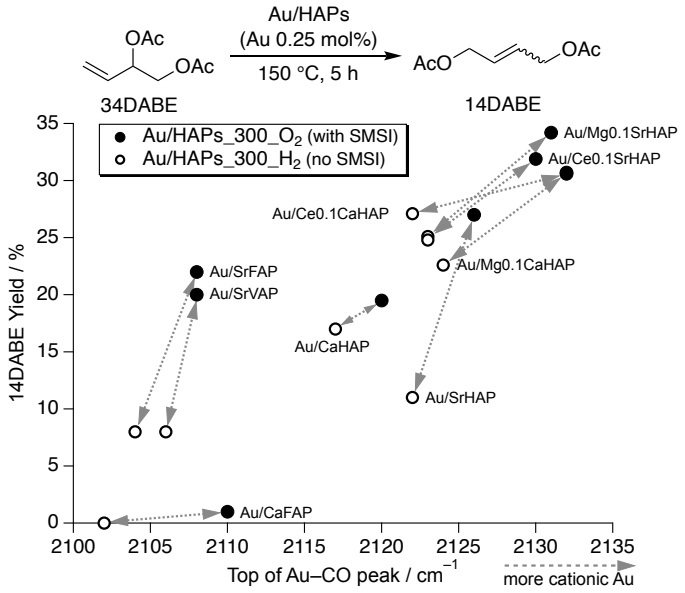

Figure 1. Relationship between the catalytic activity for 34DABE isomerization and the cationic properties of Au.

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