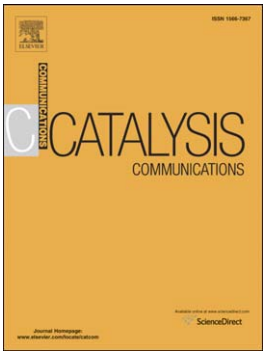

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Jinyan Sun, Xinli Tong, Zonghui Liu, Shengyun Liao, Xuli Zhuang, Song Xue

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Gold-Catalyzed Selectivity-Switchable Oxidation of Benzyl Alcohol in the Presence of Molecular Oxygen

Jinyan Sun, Xinli Tong*, Zonghui Liu, Shengyun Liao*, Xuli Zhuang and Song Xue

Tianjin Key Laboratory of Organic Solar Cells and Photochemical Conversion, School of Chemistry and Chemical Engineering, Tianjin University of Technology, Tianjin 300384, P. R. China; Tel: +86-22-60214259; E-mail: tongxinli@tju.edu.cn (X. T.); 18202587221@163.com (S. L.)

Abstract: A selectivity-switchable oxidation of benzyl alcohol by molecular oxygen is achieved with the iron doped graphene (Fe-Gr) supported gold catalysts. The oxidative esterification process is dominant with Au/Fe-Gr and K_2CO_3 as the catalyst in methanol where a 96.2% conversion of benzyl alcohol and 99.9% selectivity of methyl benzoate were obtained. While, the oxidation of benzyl alcohol is orientated to produce benzaldehyde in n-butanol using Au-Pd/Fe-Gr as the catalyst, in which an 89.1% conversion and 87.5% selectivity of benzaldehyde was attained. Moreover, the effects of the additive, reaction medium and reaction time were investigated. Also, the oxidation of different benzylic alcohols was successfully performed under the optimal conditions. Furthermore, the used catalysts were characterized by XRD, NH_3-TPD, SEM, Roman, TG-DTA and BET techniques. Based on the experimental results and phenomena, a possible reaction mechanism is proposed for the selective oxidation of benzyl alcohol with molecular oxygen in which alkyl benzoate is produce through the hemiacetal intermediate of benzaldehyde with short chain alcohol, and the generation rate of hemiacetal decides the selectivity of product.

Keywords: Selectivity-Switchable; Oxidation; Benzyl Alcohol; Graphene; Molecular Oxygen

1. Introduction