**Topic:** Hydrogen and Acetaldehyde Production from Catalytic Dehydrogenation of Ethanol

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## ABSTRACT

The aim of this research is to produce acetaldehyde and hydrogen through a catalytic dehydrogenation of ethanol. In this research, Cu, Ag, and bimetallic Cu-Ag supported by $SiO_2$ were prepared with the metal loading of 2.5-10% and applied as catalysts. They were synthesized by the conventional impregnation technique and the microwave-assisted technique, and tested in the ethanol dehydrogenation reaction under the temperature range of 250-400°C. Catalyst physical and chemical characterizations by BET, XRD, and TPR were carried out in order to elucidate the effect of active metal types, metal loading, and catalyst preparation methods on the ethanol dehydrogenation activity. From the studies, it is revealed that types of active metals, metal loading, and catalyst preparation methods had a significant influence on the reactivity. For all different metal loading (2.5, 5, and 10 wt.% of Cu, Ag, and mixed Cu-Ag) prepared by conventional impregnation technique, the catalyst activity increased with increasing metal loading and reaction temperature except at 10 wt.% $Cu/SiO_2$ catalyst. This was probably due to Cu loading increasing as a result of poor dispersion of Cu metal on support surface. In addition, bimetallic $Cu\text{-}Ag/SiO_2$ enhanced reaction activity higher than monometallic Ag. It was also found that the catalysts prepared by microwave-assisted technique were more active than the catalyst prepared by the conventional impregnation technique, which could be mainly due to the dispersion improvement of metal over support by this preparation. Among all catalysts, bimetallic $Cu\text{-}Ag/SiO_2$ prepared by microwave-assisted technique showed the highest activity and stability after 12 h of reaction.

**Keywords**: Acetaldehyde, Dehydrogenation, Ethanol, Hydrogen, Microwave-assisted technique