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Selective oxidation of 5-hydroxymethylfurfural to 2,5-furandicarboxylic acid catalyzed by bimetallic gold based catalysts

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PURPOSE OF THE ABSTRACT

Due to diminishing fossil resources, growing world population and importance of global warming, considerable attention has been focused on the conversion of biomass to valuable chemicals and fuels. One of this bio-based chemicals is 2,5-furandicarboxylic acid (FDCA). FDCA is received via catalytic oxidation of 5-Hydroxymethylfurfural (HMF), which is derived by acid catalyzed dehydration of carbohydrates. The oxidation of HMF is catalyzed by different noble metals like Au, Pt or Pd. FDCA has a wide range of possible applications, e.g. FDCA is a precursor for polyester and polyamide. The most interesting use of FDCA is the production of poly(ethylene-2,5-furanoate) a bio-based polyethylene terephthalate substitute with improved gas barrier properties.
In this work, the superior performance of low loaded mono- and bimetallic gold based catalyst for the aqueous oxidation of HMF to FDCA is shown. The oxidation was realized under batch conditions and the catalyst was prepared by wet impregnation. The reaction conditions were optimized for the low loaded bimetallic catalyst (0.1 wt% AuPt (9:1)). The influence of temperature, oxygen partial pressure, catalyst concentration, pH-value and HMF-to-metal ratio on the HMF oxidation was investigated. Additionally the effect of the catalyst preparation and catalyst composition on the catalytic activity and FDCA selectivity was evaluated.

In conclusion, excellent catalytic activity and FDCA selectivity (99%) were received for HMF oxidation under the optimized reaction conditions and with the low loaded bimetallic catalyst (0.1 wt% AuPt (9:1)).

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS
FDCA | gold catalyst | HMF oxidation

BIBLIOGRAPHY