19th International Conference on
Medicinal Chemistry & Multi Targeted Drug Delivery
&
International Conference on Catalysis and Pyrolysis
November 05-06, 2018 | San Francisco, USA

Structural effect of the Cu_xSn_{1-x} intermetallic catalyst prepared by a mechanical alloying technique in phenol hydroxylation

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Three main factors generally alter the catalytic activity. Those are the type of support material, catalyst size and addition of a second metal (i.e. alloying or intermetallic). The latter two factors result in changing electronic and geometric effects. In this work, both electronic and geometric effects were studied, using Cu and Sn as the active metals and phenol hydroxylation as a molecular probe to study its catalytic activity. After the mechanically alloyed processing of Cu and Sn, the results showed that the geometric effect strongly influenced on the catalytic activity and the cubic sorosite crystal structure of Cu_xSn_{1-x} intermetallic provided the dominant active site. Moreover, the ensemble crystal structures of monoclinic η-Cu_6Sn_5 and orthorhombic ε-Cu_3Sn could govern the conversion up to 84%. The monoclinic η-Cu_6Sn_5 crystal structure gave higher catechol (CAT) selectivity than the cubic phase crystal structure, while the influence of orthorhombicε-Cu_3Sn resulted in a greater selectivity of catechol. On the other hand, the electronic effect strongly depended on the surface structure.

Biography

Sakollaphat Pithakratanayothin was born and raised in Bangkok, Thailand, after graduating Master degree in Petrochemical Technology from the Petroleum and Petrochemical College, Chulalongkorn University, he decided to study further for his Doctor of Philosophy degree in Polymer Science and has focused on a new pathway to heterogeneous catalyst synthesis, viz. mechanical alloying. After finishing an internship at Paul Scherrer Institute (PSI), he has discovered active species of copper on his project using X-ray Absorption Spectroscopy (XAS).

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