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PII: S0257-8972(18)30468-7
DOI: doi:10.1016/j.surfcoat.2018.05.001
Reference: SCT 23375

To appear in: *Surface & Coatings Technology*

Received date: 2 March 2018
Revised date: 28 April 2018
Accepted date: 1 May 2018

Please cite this article as: Jintao Fu, Eric Detsi, Jeff Th.M. De Hosson , Recent advances in nanoporous materials for renewable energy resources conversion into fuels. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Sct(2017), doi:10.1016/j.surfcoat.2018.05.001

# Recent advances in nanoporous materials for renewable energy resources conversion into fuels

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**Abstract**

The continuous growth in energy production from non-renewable resources in order to meet the ever-increasing energy demand has given rise to serious environmental issues and moving towards renewable energy resources is necessary. Heterogeneous catalysts play a key role in the conversion of renewable resources into fuels and chemicals. The performance of heterogeneous catalysts is directly linked to their surface area, since the number of catalytic sites as well as the activity of each catalytic site increase with increasing effective footprint area of a catalyst. Therefore, nanoporous heterogeneous catalysts are very attractive, owing to their high internal surface areas and high density of active sites generated by curved internal surfaces. The overall catalytic performance of nanoporous heterogeneous catalysts can reach orders of magnitude higher than that of planar catalysts counterparts. This paper reviews recent progress toward the applicability of three-dimensional bulk nanoporous metals and their composites in (electro-)catalytic conversion of renewable resources into fuels and value-added chemicals. The primary focus is given to metal-based materials fabricated through dealloying. Dealloyed nanoporous metals and their composites can be used either directly as high-performance (electro-)catalysts, or indirectly as three-dimensional bulk current collectors along with poorly conducting electro-catalyst materials. Limitations of these material systems such as cost, scalability, and long-term stability in-service are discussed.

Keywords: nanoporosity; catalysts; water oxidation; methanol oxidation; carbon dioxide; carbon monoxide

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