

Accepted Manuscript

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PII: S1385-8947(17)30663-0
DOI: <http://dx.doi.org/10.1016/j.cej.2017.04.117>
Reference: CEJ 16871

To appear in: *Chemical Engineering Journal*

Received Date: 28 December 2016
Revised Date: 5 April 2017
Accepted Date: 25 April 2017

Please cite this article as: J. Zhao, H. Matsune, S. Takenaka, M. Kishida, Rapid and Efficient Catalytic Oxidation of As(III) with Oxygen over a Pt Catalyst at Increased Temperature, *Chemical Engineering Journal* (2017), doi: <http://dx.doi.org/10.1016/j.cej.2017.04.117>



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Rapid and Efficient Catalytic Oxidation of As(III) with Oxygen over a Pt Catalyst at Increased Temperature

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Abstract

The pre-oxidation of arsenite (As(III)) to arsenate (As(V)) is a critical step for the removal of toxic arsenic in wastewater. In this work, a Pt catalyst supported on metal oxide was applied to the pre-oxidation step of As(III) without UV irradiation. It is demonstrated that Pt catalyst can effectively promote the oxidation of As(III) using oxygen at neutral pH due to the catalytic activity of Pt itself. The Pt/ZrO₂ catalyst possessed excellent stability and could be used repeatedly with high catalytic performance. The oxidation rate of As(III) was structure-insensitive to Pt particle size and obeyed pseudo-first-order kinetics in As(III). The apparent activation energy was about 31.1 kJ/mol, which was obtained on the premise of order of 0.5 with respect to oxygen.

Keywords: Pt catalyst, pre-oxidation, As(III), oxygen, neutral condition

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