

Accepted Manuscript

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PII: S1385-8947(14)00503-8
DOI: <http://dx.doi.org/10.1016/j.cej.2014.04.071>
Reference: CEJ 12050

To appear in: *Chemical Engineering Journal*

Received Date: 31 December 2013
Revised Date: 15 April 2014
Accepted Date: 17 April 2014

Please cite this article as: H.Q. Trinh, Y.S. Mok, Plasma-catalytic oxidation of acetone in annular porous monolithic ceramic-supported catalysts, *Chemical Engineering Journal* (2014), doi: <http://dx.doi.org/10.1016/j.cej.2014.04.071>



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1 **Plasma–catalytic oxidation of acetone in annular porous monolithic**
2 **ceramic-supported catalysts**

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7
8 **Abstract**

9 Oxidative decomposition of acetone over multichannel monolithic ceramic-supported
10 catalysts combined with non-thermal plasma was investigated. Plasma was generated inside the
11 porous ceramic by applying an alternating current (AC) voltage to the coaxial electrodes. The tandem
12 plasma-catalytic reactor consisted of two ceramic-supported catalysts containing zinc oxide (ZnO)
13 and/or manganese oxide (MnO₂), in which the first supported catalyst was exposed to the plasma
14 discharge and the second one was placed in the post-plasma region. Several sets of catalyst
15 arrangements such as MnO₂-loaded monolith followed by bare monolith, ZnO-loaded monolith
16 followed by bare monolith, ZnO-loaded monolith followed by MnO₂-loaded monolith and two
17 consecutive MnO₂-loaded monoliths with different Mn contents were examined in relation to the
18 acetone decomposition and the byproducts formation. More than 90% of acetone was decomposed at
19 a specific input energy (SIE) of about 1.0 kJ L⁻¹ with the catalyst arrangement of MnO₂ (0.1% Mn)
20 followed by MnO₂ (5.0% Mn), while the decomposition efficiency obtained with two consecutive
21 bare monoliths was about 66 % at the same SIE. The use of ZnO in the plasma discharge region did
22 not largely improve the acetone decomposition efficiency. Wherever it is placed either in the plasma
23 discharge region or in the post-plasma region, MnO₂ catalyst substantially promoted the acetone
24 decomposition, obviously due to the dissociation of ozone into far more reactive oxygen atoms
25 available for oxidizing acetone molecules.

26
27 **Keywords:** Acetone decomposition; DBD plasma; Catalyst; Manganese dioxide; Zinc oxide

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