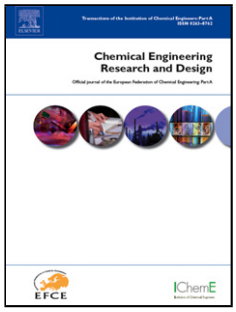

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PII: S0263-8762(14)00202-0
DOI: http://dx.doi.org/doi:10.1016/j.cherd.2014.04.026
Reference: CHERD 1570

To appear in:

Received date: 25-10-2013
Revised date: 13-4-2014
Accepted date: 25-4-2014

Please cite this article as: Assadi, A.A., Bouzaza, A., Lemasle, M., Wolbert, D.,Removal of trimethylamine and isovaleric acid from gas streams in a continuous flow surface discharge plasma reactor, *Chemical Engineering Research and Design* (2014), http://dx.doi.org/10.1016/j.cherd.2014.04.026

Removal of trimethylamine and isovaleric acid from gas streams in a continuous flow surface discharge plasma reactor

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Abstract

The removal of isovaleric acid (IVA) and trimethylamine (TMA) using nonthermal plasma (NTP) in a continuous surface discharge reactor is investigated. The influence of the energy density shows that its increment is accompanied by the increase of the removal rate. At flowrate equal to 2 $m^3.h^{-1}$, when energy density extends three times, the removal rates of IVA and TMA are increased from 5 to 15 $mmol.m^{-2}.h^{-1}$ and from 4 to 11 $mmol.m^{-2}.h^{-1}$, respectively. The impact of relative humidity (RH) is also studied. An increase in % RH (up to 20%) leads to a decrease of the removal rate. Additionally, the formation of by-products in the surface discharge reactor and the plausible reaction mechanism of the two VOC were also detected and discussed. Moreover, a kinetic model taking into account the mass transfer step is developed in order to represent the experimental results. The model shows a good agreement with experimental results.

Keywords

Surface discharge, VOCs, mass transfer, relative humidity

1. Introduction

VOCs are hazardous to health and environment; their emission causes serious environmental problems such as stratospheric ozone depletion, photochemical smog, greenhouse effect and so on (**US EPA, 2008; Le Cloirec, 1998**). Increasing awareness of these emissions has resulted in legislation requiring stringent enforcement of new regulations to improve the quality of the environment **(US EPA, 2008)**. To remove those gaseous