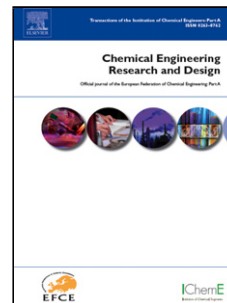


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Author: Aymen Amine Assadi Abdelkrim Bouzaza
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Removal of trimethylamine and isovaleric acid from gas streams in a continuous flow surface discharge plasma reactor

Aymen Amine ASSADI^{a,b}, Abdelkrim BOUZAZA^{a,b*}, Marguerite LEMASLE^{a,b}, Dominique WOLBERT^{a,b}

^a Laboratoire Sciences Chimiques de Rennes - équipe Chimie et Ingénierie des Procédés, UMR 6226 CNRS, ENSCR, 11 allée de Beaulieu, 35700 Rennes, France.

^b Université Européenne de Bretagne.

* Corresponding author. Tel.: +33 2 23238056; fax: +33 2 23238120.

E-mail address: Abdelkrim.bouzaza@ensc-rennes.fr (A. Bouzaza)

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 $2 \text{ m}^3 \cdot \text{h}^{-1}$, when energy density extends three times, the removal rates of IVA and TMA are increased from 5 to 15 $\text{mmol} \cdot \text{m}^{-2} \cdot \text{h}^{-1}$ and from 4 to 11 $\text{mmol} \cdot \text{m}^{-2} \cdot \text{h}^{-1}$, 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

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