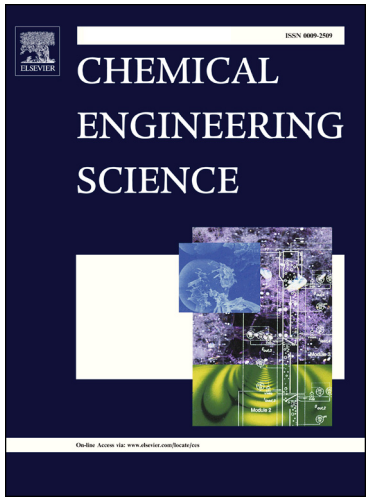

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Degradation of methylene blue using double-chamber dielectric barrier discharge reactor under different carrier gases

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Abstract

The decomposition of methylene blue (MB) via a novel double-chamber dielectric barrier discharge (DBD) reactor in different carrier gases (air and oxygen) was investigated. The results showed that the degradation efficiency of MB was 99.98% using O_2 plasma for 20 min, while it was only 85.3% using air plasma for 100 min. In addition, the concentrations of nitrite, nitrate, ozone and hydrogen peroxide in aqueous phase and the oxidizing ability of the oxidants were measured to explore the various results obtained in different carrier gases. The formation of nitrogenous species was considered to be the main reason for the low degradation efficiency of the air plasma. The accumulation of oxidants enhanced the degradation efficiency of the MB in the O_2 plasma. Both the combined effects of ozonation and plasma with oxygen bubbling and the reaction poisoning with air bubbling were enhanced in the double-chamber DBD reactor. The decomposition routes of MB and byproducts formation were also proposed.

Keywords: Methylene blue; Dielectric barrier discharge; Oxidants; Nitrogenous species; Mechanism

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