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Study on *In-Situ* Regeneration and Reaction Mechanism of Meta-Xylene Saturated Resins with Dielectric Barrier Discharge

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ABSTRACT: In order to develop an environmentally friendly volatile organic compounds treatment process, the concentrated adsorption resins integrated with the plasma degradation process simultaneously disposed the meta-xylene, which was one of the commonly VOCs. In this study, a coaxial dielectric barrier discharge reactor equipped with a high-voltage pulsed power supply was used as *in-situ* regeneration of the saturated polystyrene resins. The adsorption capacity, degradation efficiency, changes in microstructure and surface functional groups of the virgin and regenerated resins were analyzed, respectively. In addition, the gas phase by-products during the regeneration process were primarily identified. The results showed that the regeneration efficiency remained above 60% and energy efficiency after eight regeneration cycles was greater than 7.5 $g \cdot kW^{-1} \cdot h^{-1}$. The surface structure and microstructure of the virgin and regenerated resins, characterized by Fourier Transform Infrared Spectroscopy and Scanning Electron Microscope, did not be seriously damaged by the plasma discharge process. The composition of gas by-products monitored by Gas Chromatography Mass Spectrometry was mainly acetic acid and benzene series. Based on the analytical results, the regeneration mechanism of meta-xylene adsorbed on the resins were proposed.

Keywords: Dielectric barrier discharge; Plasma; Resins regeneration; Adsorption capacity; Reaction mechanism.

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