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MULTISTAGE SYSTEM TO DEGRADE TOLUENE IN POLLUTED AIR

One of the main factors influencing environmental problems is the constant increase in emissions of pollutants into the atmosphere, highlighting volatile organic compounds (VOCs) such as toluene. In the first stage of this project, a continuous system used in the toluene removal study was studied by boiling a synthetic solution of 100 ppm toluene in ethanol, which was initially passed through the adsorption column with activated carbon reactor (AC), followed by the electrochemical reactor (EC), and finally, photolytic reactor (P), for 60 min. The AC contained activated carbon (HYCEL, PM 12.01) packed in a 6 cm long column with a diameter of 2.5 cm. The EC consisted of a cylindrical PVC reactor (30 x 10 cm), stainless steel cathode, and TiO2,nt|Ti anode; the P was made of stainless steel and equipped with a 358 nm UV lamp. The toluene removal was evaluated by gas chromatography with a BID detector (Shimadzu, Nexus GC-2030). In the project's second stage, a cylindrical High-Density Polyethylene (HDPE) reactor was designed and built. This reactor, housing the study electrodes, was used to process a sample of air from Mexico City with a toluene concentration between 117-100 ppb. A constant potential of 2 V was applied to the system for 3 hours, and samples were collected at the reactor outlet for mass gas chromatography. The individual toluene removal efficiencies were AC-50.29%, EC-44.38%, and P-52.71%. However, the most impressive result was when the three reactors were coupled in a multistage system (AC+EC+P), achieving a remarkable toluene removal efficiency of 99.58%.

Keywords

adsorption, activated carbon, electro-oxidation, photolysis, toluene.

Reference

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Author approval

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