

Synthesis of titanium and diamond-like carbon thin films bi-layers used as an electrode for electrochemical advanced oxidation in diuron degradation by dc magnetron sputtering

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Diuron is famous pesticide and its residual can contaminate in natural water resource resulting in environmental issue and human health. There are several processes that have been used to overcome diuron contamination including adsorption, biochemical, and advanced oxidation processes. An electrochemical advanced oxidation process (EAOP) is one of the advanced oxidation processes used to degrade Diuron with high efficiency. In this research, the binary layers of titanium and diamond-like carbon (Ti/DLC) thin films were deposited by dc magnetron sputtering method on the surface of 304 stainless steel substrates to be utilized as electrodes for EAOP. The effect of nanostructure of diamond-like carbon thin films on diuron degradation and corrosion of electrode were studied. The Ti/DLC bi-layers were characterized by XPS. The results show that the samples of Ti/DLC bi-layers, synthesized under the operating pressure of 5, 20, and 25 mTorr, demonstrated the sp^2/sp^3 ratio of 0.345, 0.327, and 0.544 respectively. The Ti/DLC bi-layers were used as electrodes of EAOP in the microchannel reactor for diuron degradation. The diuron concentration during the process was investigated by HPLC. It could be observed that the Ti/DLC bi-layers with the high sp^2/sp^3 ratio (0.544) exhibited the highest removal efficiency, up to 69 percent within 200 seconds of the residence time in a microchannel reactor. The Ti interlayer could improve the adhesion between DLC thin films and the substrate, hence, reducing the corrosion of electrode.

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