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Usefulness of a Technique Based on Negative Corona Discharge for the Degradation of Selected, Condensed PAHs: Application to the Oxidation of Anthracene and Similar Structures

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Abstract: The usefulness of negative corona discharge for oxidation of condensed polycyclic aromatic hydrocarbons (PAHs), including anthracene, naphthalene and 2,3-benzanthracene, adsorbed on a solid substrate is evaluated. In the case of anthracene, the application of corona discharge under high voltage (10-20 kV) for 10 to 180 min with a current intensity of 5-120 μ A in a controlled, humid atmosphere leads to the progressive formation of anthraquinone. A kinetic study of the anthracene oxidation shows that the apparent half-lives range from 5 to 48 min, according to the initial anthracene amount (50-5000 nmol), indicating a reaction order between 0 and 1. The effect of corona discharge current intensity and the role of corona discharge-produced high-speed electrical wind (\approx 10 m/s) are discussed. The efficiency of the solid-phase corona discharge method is found to depend on the adsorption strength of the PAH molecules on the solid substrate and/or their capacity to be sublimated under the influence of electrical wind. Key Word: PAHs; anthracene; naphthalene; 2,3-benzathracene; corona discharge; oxidation.

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