

APPLICATION OF HUMIC SUBSTANCES IN ENVIRONMENTAL ENGINEERING

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Interactions of humic substances with environmental organic chemicals have long been reported (Choudhry, 1984; Kochany et al., 1990). It has been found that humic substances can enhance biotic and abiotic degradation of phenols, polyaromatic hydrocarbons (PAH) and pesticides in the aquatic environment. The catalytic effect of humic substances on degradation of organic chemicals in water and soil environment is particularly strong in photooxidation and biooxidation of large molecules like phthalates, fatty acids and PAH. These properties make humic substances attractive material for bioremediation.

Conestoga-Rovers & Associates (CRA) recently initiated biological studies on application of humates in bioremediation. The studies were conducted on humates supplied by U-Mate International using N-CON respirometric system at CRA laboratory in Waterloo, Ontario. The purpose of the studies was to determine the effect of humates on biological activities of activated sludge (RAS) from wastewater treatment plant. Respirometric tests included humates without RAS, RAS with various amounts of humates and RAS with canola oil and humates. The tests were supported by chemical analyses of respirometric reactor contents before and after the tests.

Preliminary results of respirometric studies indicated that the effect of humates on biological processes depends on humates/biomass ratio. It has been found that humates could support biological activities of RAS if no other food source is available. Humates also enhance biodegradation of canola oil but the extent of this phenomenon depends on oil/humate and humate/RAS ratios. It has also been observed that the presence of humates increases solubility and bioavailability of oil. This observation is particularly important since the presence of oils in wastewater substantially decreases the efficiency of treatment in wastewater treatment plants.

Biological studies on industrial wastewater demonstrated that humates substantially increase biodegradation of phenol and formaldehyde and mitigate inhibitory effect of copper. It is expected that the studies will provide a background for full-scale application of humates in environmental engineering, particularly in heavy metals and toxic organics removal prior to biological treatment.

References

Choudhry G. G. "Humic Substances. Structural, Photophysical, Photochemical and Free Radical Aspects and Interactions with Environmental Chemicals". Gordon and Breach Science Publishers, 1984, 185 pp.

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