

## Treatment and degradability of direct dyes in textile wastewater by ozonation: A laboratory investigation

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### ABSTRACT

In this study the factors affecting the rate of chemical oxygen demand of a synthetic waste solution containing water soluble direct dyes (Sirius Red F3B and Sirius Blue SBRR) by ozone gas were investigated. The research was conducted using a batch bubble column to take the advantage of the intensive back-mixing that prevails in bubble columns. In result of our experimental study, we have shown that the COD of direct dyestuff wastewater was reduced 58.89% for Sirius Red F3B and 60.95% for Sirius Blue SBRR after ozone bubbling treatment for 2 h. In addition the results indicate that during the ozonation, even though complete Sirius Red F3B and Sirius Blue SBRR degradation occurs in 10 min, ozone consumption goes on for a further 20 min after which time most degradation reactions are completed. Results of kinetic study showed that ozonation of the aqueous direct dyes were a pseudo-first-order reaction with respect to the dye. The apparent rate constant increased with both applied ozone dose and temperature, but declined logarithmically with the initial dye concentration. The main ozonation by-products, identified by HPLC, IC and GC-MS are formaldehyde, acetaldehyde, glyoxal, acetone, acetic acid, formic acid, oxalic acid and carbonic acid, plus nine Sirius Red F3B and twelve Sirius Blue SBRR derivatives are scarcely degradable.

*Keywords:* Ozonation; Sirius Red F3B; Sirius Blue SBRR; Direct dye; Chemical oxygen demand; Degradability; Wastewater treatment

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