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*"Gheorghe Asachi" Technical University of Iasi, Romania*

# MICROPLASMA DISCHARGE FOR COMPLETE DEGRADATION OF METHYL RED DYE – EVALUATION WITH UV AND PHOTODEGRADATION

**Sellamuthu Ravichandran Varshaa, Elackad Rajappan Kavitha, Nagaraj Thirumurugan, Kalidass Suresh***

*Surface & Environmental Control Plasma Laboratory, Department of Physics, Bharathiar University, Coimbatore-641046, Tamil Nadu, India*

## Abstract

Rapid growth in industrialization, and consumerism had surged the usage of chemicals and synthetic dyes, and its indiscriminate discharge through industrial wastewater. Atmospheric pressure non-thermal plasma is as an emerging technology for efficient removal of contaminants from wastewater. In this work, microplasma discharge method is employed to degrade Methyl red dye (10 and 20 ppm) in aqueous solution. Complete degradation was achieved within 17 min microplasma treatment, using air and nitrogen as plasma forming gases. First order kinetic model was fitted and rate constant values were found to be 0.3074 and 0.2908 for air and nitrogen plasma, respectively. As the applied voltage increases from 6.5 to 7.8 kV, the degradation percentage increases (10-15%) significantly. Chemical parameters such as pH, conductivity, total dissolved solids and salinity of the treated samples were measured. Efficiency of microplasma treatment was compared with UV light and direct sunlight photodegradation. The degradation percentage of Methyl red under UV light degradation was 26%, for 10 ppm at 20 hours of irradiation; for direct sunlight irradiation it was 2% only after 5 hours irradiation. When the plasma treated Methyl red, (6 and 9 min) was exposed to direct sunlight, complete degradation was obtained within 45 and 15 mins, respectively. This reveals that, even though the plasma source is cut-off, the reactive species in the solution continuously reacts with the dye molecules promoting complete degradation. The results depict that the microplasma treatment can be an effective method to degrade organic pollutants, which could be applicable for industrial wastewater treatment.

*Key words:* dye degradation, methyl red, microplasma, non-thermal plasma, reactive species

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* Author to whom all correspondence should be addressed: e-mail: ksureshphy@buc.edu.in