DEGRADATION OF CYLINDROSPERMOPSIN USING ADVANCED NON-THERMAL PLASMA TECHNOLOGIES

M. Schneider[1], R. Rataj[2], J.F. Kolb[2], L. Bláha[1]

[1]*RECETOX, Masaryk University, Faculty of Science, Kamenice 753/5, 62500 Brno, Czech Republic*
[2]*Leibniz Institute for Plasma Science and Technology (INP Greifswald e.V.), Felix-Hausdorff-Straße 2, 17489 Greifswald, Germany*

Corresponding author: schneider@recetox.muni.cz

Non-thermal plasmas (NTPs) have received much attention for their application in wastewater and air purification. Classified as Advanced Oxidation Processes, plasmas ignited in water or at the air-water interface efficiently generate a vast range of reactive species. Although plasmas have been shown to even degrade recalcitrant organic pollutants such as pharmaceuticals, available information for their application in drinking water treatment and cyanotoxin degradation is limited.

In the present research, six different plasma sources – corona, surface, spark, gliding arc and dielectric barrier discharges (DBD) and a plasma jet – were compared for their efficiency to degrade a cyanobacterial extract containing cylindrospermopsin. Two plasma types were then selected for further in-depth study of the efficiency and degradation mechanisms.

The spark discharge showed the most energy-efficient degradation, followed by the other sources showing similar efficiencies, while the plasma jet was least efficient. The follow-up detailed studies included the corona-like discharge and the DBD. For the corona-like plasma, the degradation efficiency increased with increasing voltage and solution pH. After 15 min of plasma treatment at pH $\geq$ 7.5 degradation even progressed without further plasma application. This pH-dependent effect was not observed in the DBD reactor, whose degradation efficiency increased with decreasing voltage. Degradation in the corona-like plasma is primarily promoted by hydroxyl radicals, whereas the DBD reactor mainly produces ozone and NO_x.

The application of NTPs appears to be an innovative and promising approach for efficient removal of cyanotoxins such as cylindrospermopsin from drinking water.

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