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Title: Comparison between the degradation effect induced by low pressure air plasma and at atmospheric pressure of diethyl (3h-1-ethoxy-3-phenoxazinylidene) ammonium chloride solution

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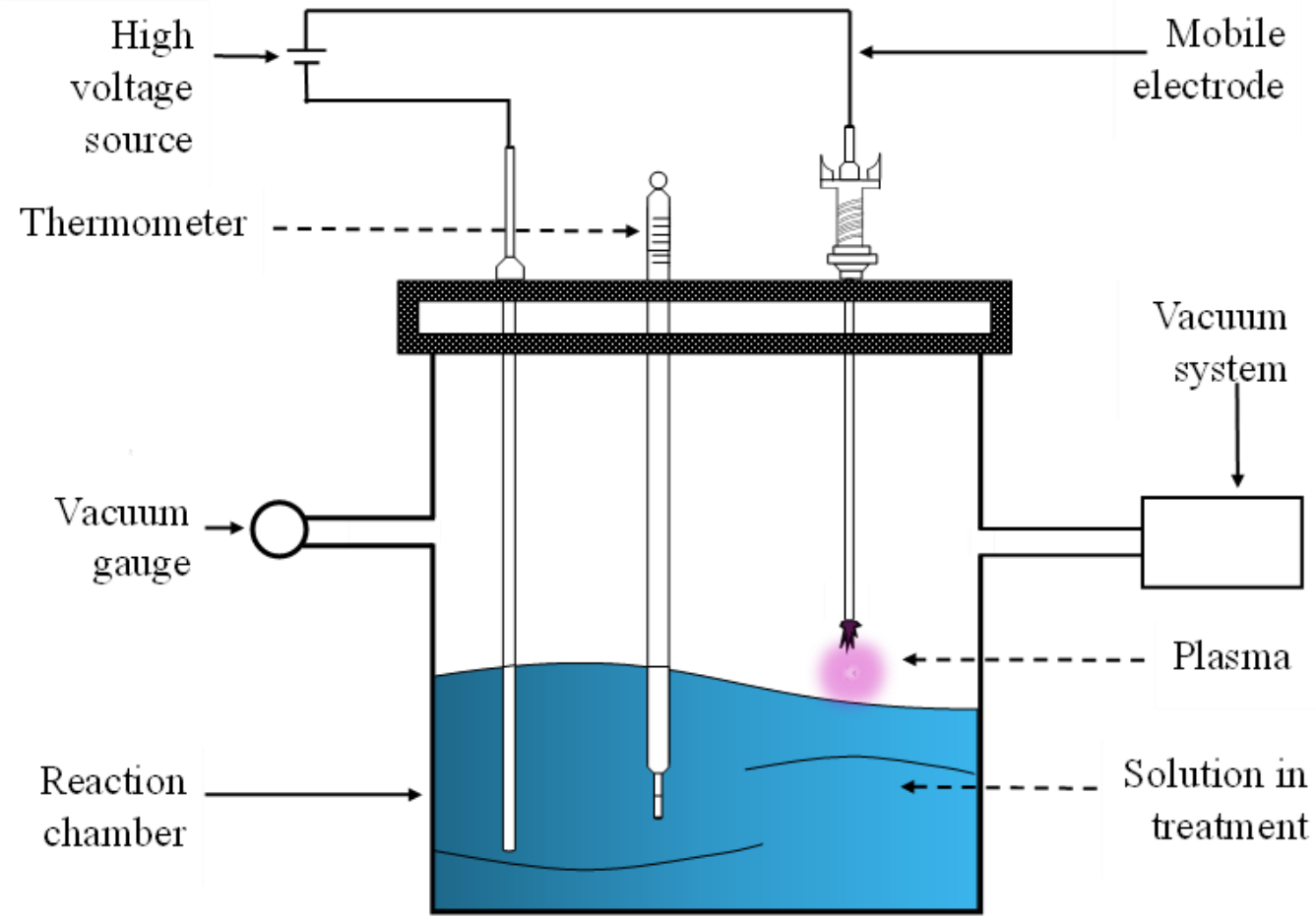
Introduction

- Water is a vital natural resource, indispensable for human life and the sustainability of the environment.
- Among the numerous contaminants that affect water quality are emerging contaminants (or microcontaminants).
- Plasma technology has been considered as an option for wastewater treatment.
- The type of gas used to generate plasma for water treatment is essential for the efficiency of the process.

Objective of the experiment

Compare the effectiveness of degradation of a contaminant in aqueous solution achieved by exposure to an air plasma at atmospheric pressure and that achieved by an air plasma at low pressure.

Methodology



Methodology

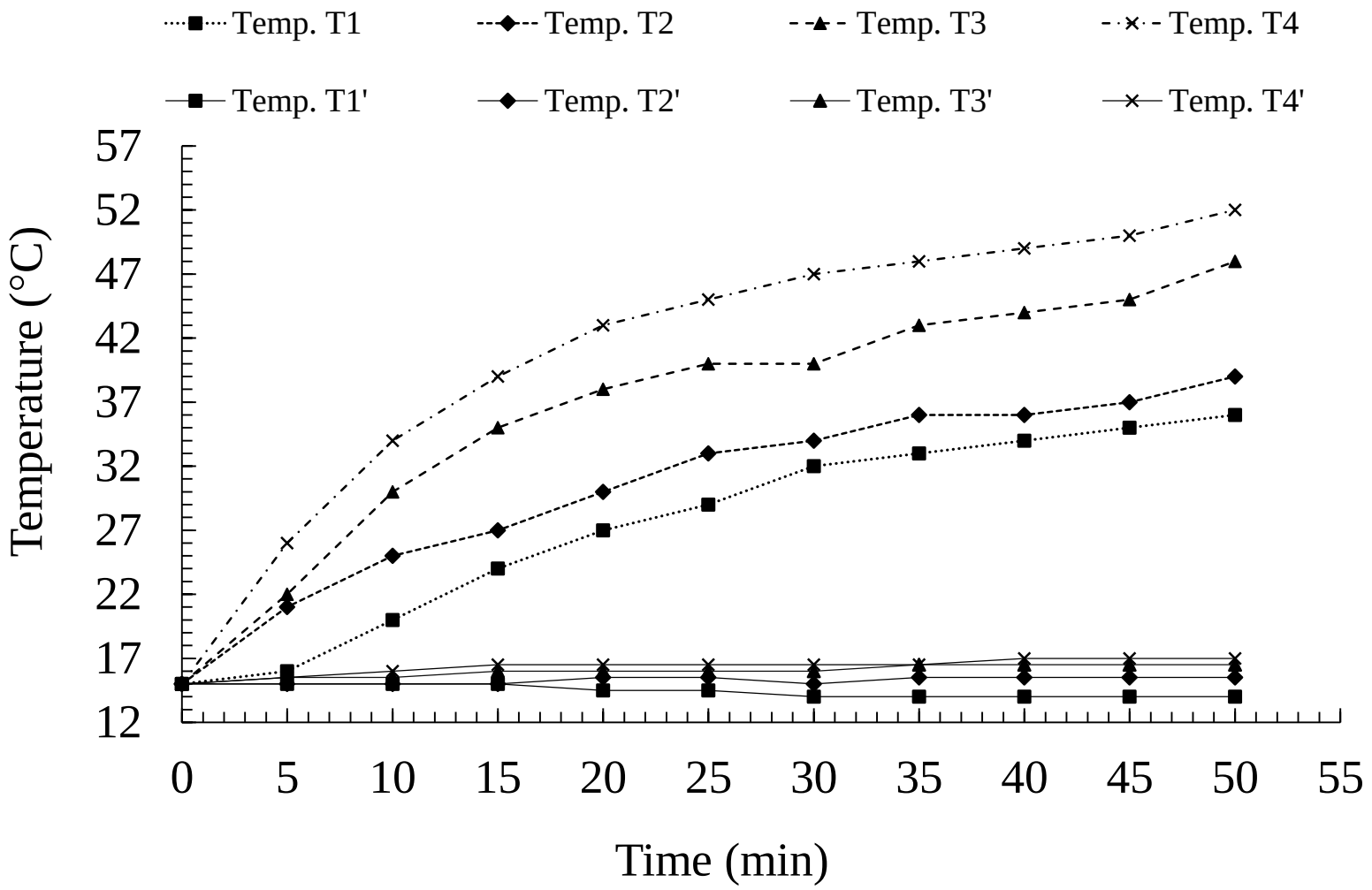
Parameters considered for experimenting. Treated volume of contaminated water per experiment: 250 ml.

Treatment	Treatment time (minutes)	Concentration (mg / l)	Voltage (Volts)	Electric Current (mA)
T1	50	17.00	1500	10
T2	50	17.00	1500	15
T3	50	17.00	1500	20
T4	50	17.00	1500	30

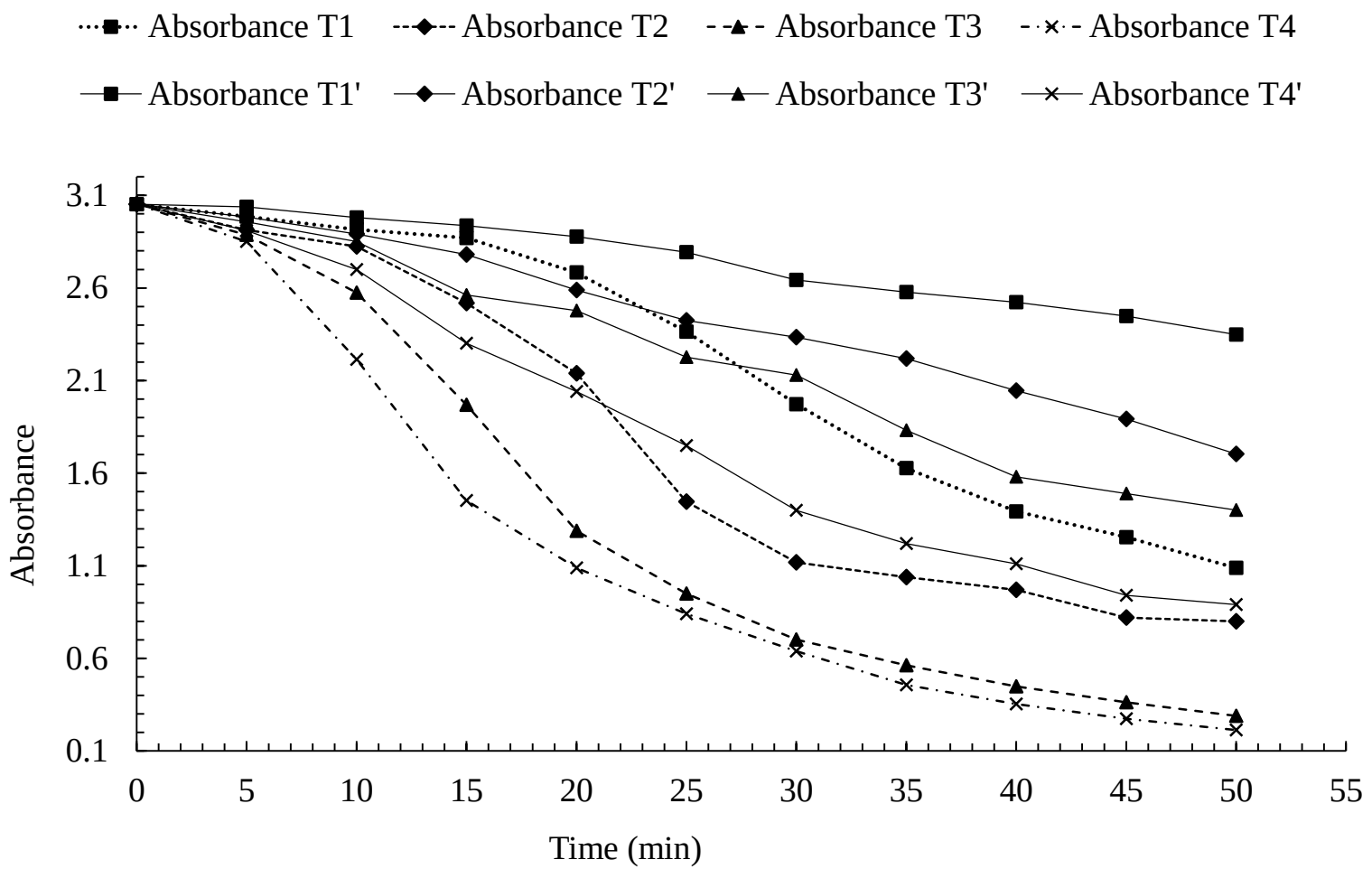
Results

The temperature, absorbance, pH, chemical oxygen demand, and toxicity results are presented.

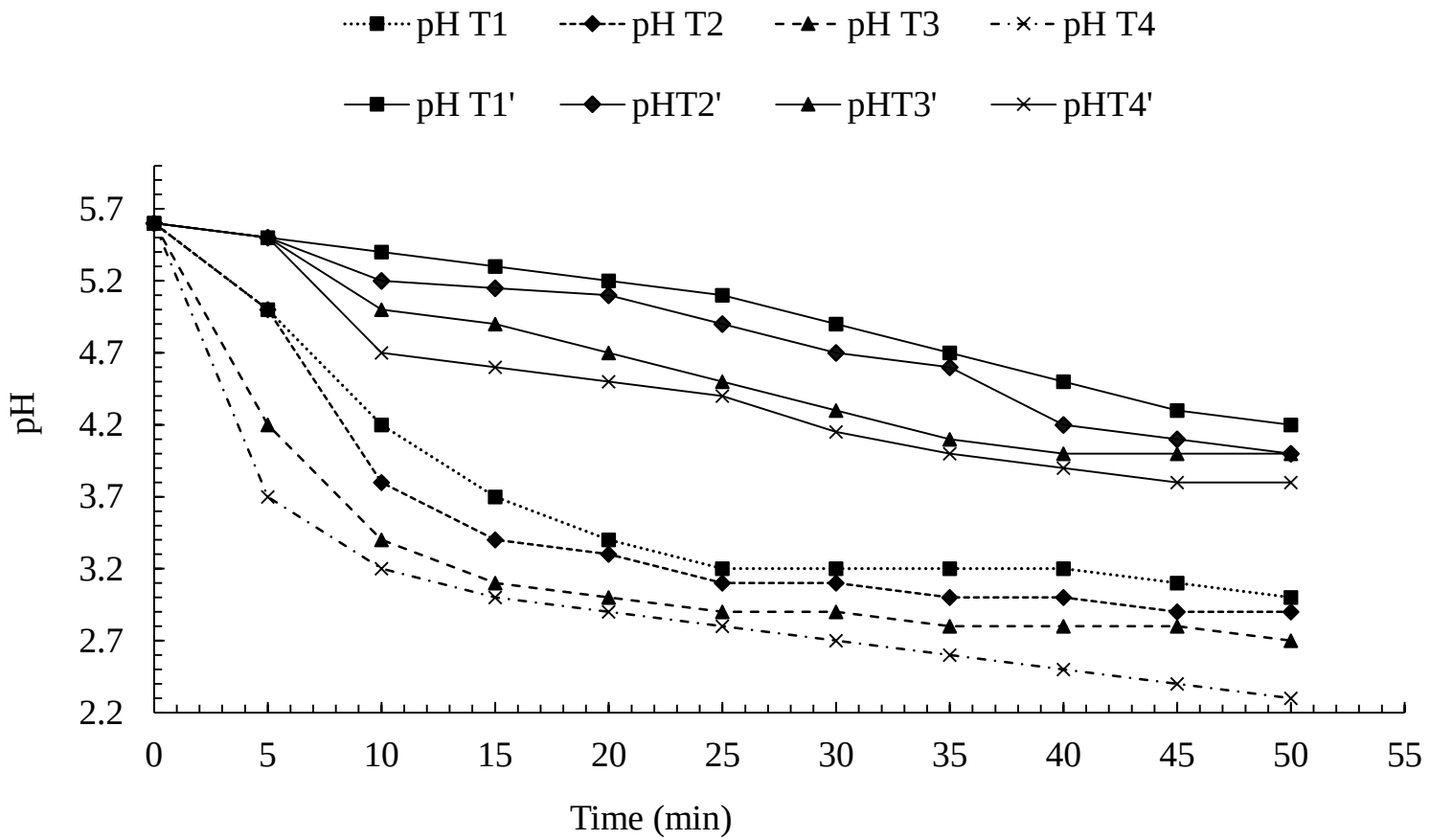
Plasma treatments at atmospheric pressure (T) and low pressure (T') of the diethyl (3H-1-ethoxy-3-phenoxazinylidene) ammonium chloride dye solution show that the results obtained depend on the experimental pressure considered (number of air molecules in the reaction chamber).



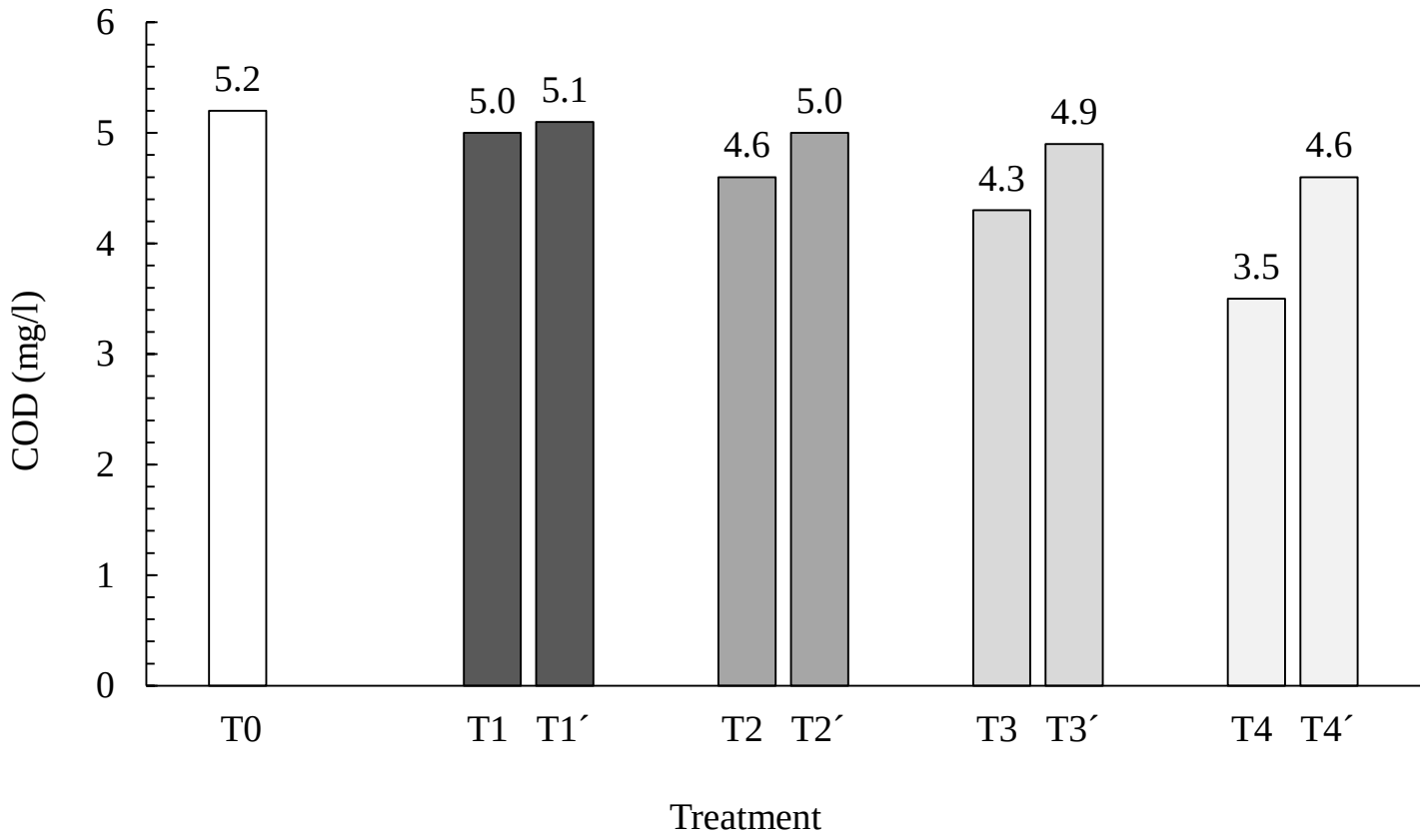
Change in temperature of the aqueous solution of diethyl (3H-1-ethoxy-3-phenoxazinylidene) ammonium chloride after exposure to an air plasma at atmospheric pressure (T) and at low pressure (T') as a function of the exposure time and the electric current generating the plasma



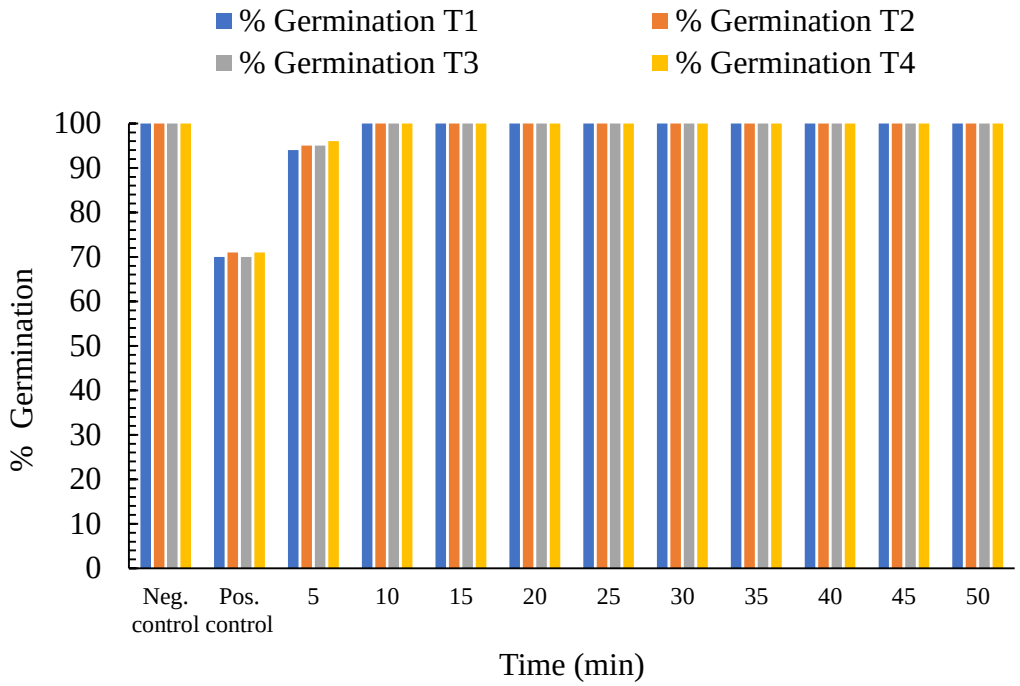
Absorbance change of diethyl (3H-1-ethoxy-3-phenoxazinylidene) ammonium chloride aqueous solution after exposure to an air plasma at atmospheric pressure (T) and at low pressure (T') as a function of exposure time and the electric current generating the plasma



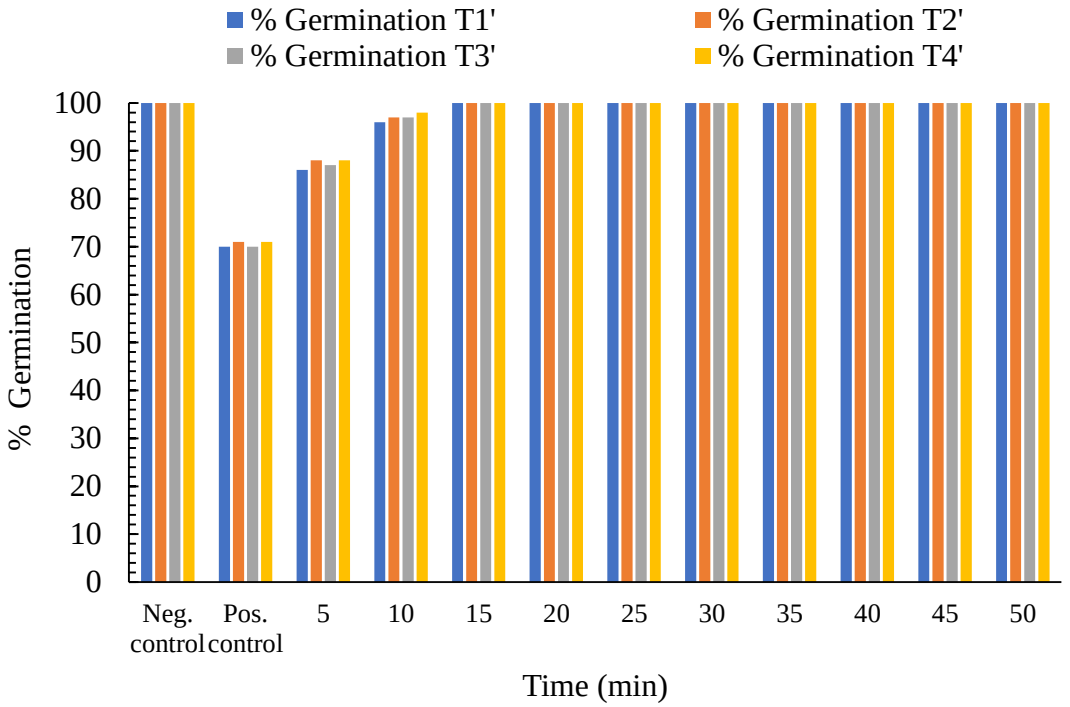
The behaviour of the pH change of the diethyl (3H-1-ethoxy-3-phenoxazinylidene) ammonium chloride dye solution, as a function of the exposure time to non-thermal plasma, the value of the electric current and the pressure in the reaction chamber. Atmospheric pressure (T) and low pressure (T')



COD change of the diethyl (3H-1-ethoxy-3-phenoxazinylidene) ammonium chloride dye solution after exposure to air plasma as a function of plasma generation electrical power. T0 is the initial value of the solution of interest without treatment



Percentage of germination of *Lactuca sativa* lettuce seeds hydrated with an aqueous solution of diethyl (3H-1-ethoxy-3-phenoxazinylidene) ammonium chloride, exposed to an air plasma at atmospheric pressure (T) as a function of the time of exposure and the electrical current generated by the plasma. Negative control: distilled water; positive control: aqueous diethyl (3H-1-ethoxy-3-phenoxazinylidene) ammonium chloride solution without treatment



Percentage of germination of *Lactuca sativa* lettuce seeds hydrated with an aqueous solution of diethyl (3H-1-ethoxy-3-phenoxazinylidene) ammonium chloride, exposed to a low-pressure air plasma (T') as a function of time exposure and electrical current generating plasma. Negative control: distilled water; positive control: aqueous diethyl (3H-1-ethoxy-3-phenoxazinylidene) ammonium chloride solution without treatment

Conclusions

The degradation of the dye is more significant in processes at atmospheric pressure than at low pressure, according to the established process.

In particular, this experiment shows that the number of air molecules inside the reaction chamber in which the dye of interest is exposed to the plasma is decisive for the degradation efficiency.

The presence of air molecules (Nitrogen and oxygen) is fundamental for carrying out the chemical and physical processes that allow the transformation of chemical compounds dissolved in water after their exposure to a plasma—the greater the number of air molecules in the treatments, the greater the degradation of the pollutant.

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