

RF Plasma Discharge Equipment for Conservation Treatments of Paper Supports

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Abstract : The application of cold radio-frequency (RF) plasma in the conservation of cultural heritage became important in the last decades due to the positive results obtained in decontamination treatments. This paper presents an equipment especially designed for RF cold plasma application on paper documents, developed within a research project. The equipment allows the application of decontamination and cleaning treatments on any type of paper support, as well as the coating with a protective polymer. The equipment consists in a Pyrex vessel, inside which are placed two plane-parallel electrodes, capacitively coupled to a radio-frequency generator. The operating parameters of the equipment are: 1.2 MHz frequency, 50V/cm electric field intensity, current intensity in the discharge 100 mA, 40 W power in the discharge, the pressure varying from $5 \cdot 10^{-1}$ mbar to $5.5 \cdot 10^{-1}$ mbar, depending on the fragility of the material, operating in gaseous nitrogen. In order to optimize the equipment treatments in nitrogen plasma have been performed on samples infested with microorganisms, then the decontamination and the changes in surface properties (color, pH) were assessed. The analyses results presented in the table revealed only minor modifications of surface pH the colorimetric analysis showing a slight change to yellow. The equipment offers the possibility of performing decontamination, cleaning and protective coating of paper-based documents in successive stages, thus avoiding the recontamination with harmful biological agents.

Keywords : nitrogen plasma, cultural heritage, paper support, radio-frequency

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