

MONITORING OF LOW-PRESSURE PLASMA TREATMENT OF SURFACES BY REAL-TIME OPTICAL EMISSION SPECTROSCOPY

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One efficacious application of non-equilibrium plasmas is found in textile industry for treatments of textile surfaces [1-2]. For example, pretreatments of cotton textile in low-pressure N₂ plasma cause activation of the surface resulting in improvement of adherence of species or Functional carbonaceous material (FCM) (such as microcapsules) intended to enhance properties of the fabric [3]. However, to have completely controllable treatments, one needs a reliable real-time monitoring with the monitoring parameter associated both to plasma and surface processes. In order to investigate such possibility, we treated bleached cotton samples in low-pressure N₂ plasma in a chamber with parallel-plate electrodes employing time-resolved optical diagnostics of plasma volume above the sample by using a spectrometer with a fast ICCD camera. The effect of the treatment on the sample surface was investigated in colorimetric measurements on dye adsorption by using a reflectance spectrophotometer. Comparing the colorimetric measurements of the treated samples, i.e. K/S values, with the time evolution of N₂ 2nd positive system line intensity during series of treatments for different electrode gaps, we correlated the slope of the time evolution with the K/S values. Linear fits of the line intensity data show that lower slope coefficient correspond to higher K/S values where the best adsorption of FCM was attained. Thus, for cotton treatments in N₂, time evolution of the 337 nm optical emission line proved to be a suitable parameter to follow the efficiency of cotton sample surface activation in the plasma treatment.

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References

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