

# **Application of gliding arc discharge plasma for the creation of plasma activated water**

L. Marcinauskas<sup>1,3</sup>, M. Aikas<sup>1</sup>, L. Ragelienė<sup>2</sup>, G. Minelgaitė<sup>2</sup>, E. Jankaitytė<sup>2</sup>, R. Uscila<sup>1</sup>, A. Tamošiūnas<sup>1</sup>, V. Mildažienė<sup>2</sup>

<sup>1</sup>*Plasma Processing Laboratory, Lithuanian Energy Institute, Kaunas, Lithuania*

<sup>2</sup>*Faculty of Natural Sciences, Vytautas Magnus University, Kaunas, Lithuania*

<sup>3</sup>*Department of Physics, Kaunas University of Technology, Kaunas, Lithuania*

The main aim of the study was to adopt the gliding arc discharge (GAD) plasma device for the creation of the plasma-activated water (PAW) and to determine the relationship between the physicochemical properties of treated water and composition of the produced PAW. The composition of the air plasma was investigated using the flame-emission spectrometer and acousto-optic emission spectrometer. It was found that the main species in the emission spectra of the air plasma were  $N_2$ ,  $N_2^+$ ,  $N^+$ , NO and O particles. The increase of the input voltage increased the ionization degree of the plasma and enhanced the intensities of the emission lines attributed to  $N_2^+$ , NO and O species. The physicochemical properties of PAW strongly depended on the treatment duration, the plasma discharge voltage, and the initial chemical composition of the used water (tap water, deionized water, and deionized water supplemented by salts was compared). Specific electrical conductivity, pH, concentration of nitrates and hydrogen peroxide in PAW varied depending on the type and composition of salts dissolved in water. Regardless of the compliance of tap water properties with the approved requirements, substantial variations in its composition led to differences in chemical properties of PAW, including the content of biologically active compounds. The increase of the plasma treatment duration from 150 to 600 s (at input voltage of 170 V), increased the pH values, conductivity of the tap water and hydrogen peroxide concentration. Therefore, the results of estimation of PAW effects on the plants are hardly reproducible when using PAW obtained from the tap water. The addition of known concentrations of  $Ca^{2+}$ ,  $Mg^{2+}$  and  $Fe^{3+}$  salts to the deionized water favours obtaining the controllable PAW composition and more reliable results on the PAW effects on plants. The concentrations of nitrates in the plasma activated deionized water increased up to 4 times after one week after plasma treatment.

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