BREAKDOWN AND CHARACTERISTICS OF NON-EQUILIBRIUM LOW-PRESSURE DC DISCHARGES IN VAPOURS OF LIQUIDS

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Abstract. The study of non-equilibrium discharges in liquids and their vapors have become very popular due to a variety of possible applications, such as in nanoscience for the synthesis of nanographene layers and fast growth of carbon nanotubes (Hagino et al. 2012), for the treatment of materials and surfaces (Fumagalli et al. 2012), in biomedicine (Stalder et al, 2006), for polymerization processes and thin-film synthesis (Brunet et al. 2017), in fuel industry - sources of hydrogen (Petitpas et al. 2007), for purification and decontamination (Kitano et al. 2006), etc. However, emergence of new devices demands knowledge on elementary processes and their balance in discharge that can be obtained from studies of breakdown and electrical characteristics of discharges. Here we present results of the comprehensive experimental investigation of breakdown properties, spectra, spatial and spectrally resolved emission and V-A characteristics in low-pressure discharges in vapours of methanol, ethanol, isopropanol, n-butanol and water that provide sets of data for different operating regimes (Sivoš et al. 2015, 2019). Furthermore, we performed a detailed analysis of unusual behaviour of the discharge observed at the transition from normal to abnormal glow regime in methanol and ethanol vapour and the existence of double channels of the discharge observed in Townsend and normal glow regime in water vapour. Therefore, this paper aims to give an overview of breakdown data and data for Volt-Ampere (V-A) characteristics of discharges in vapours of studied liquids; and to emphasize some of the issues that can be important in the analysis and interpretation of results.

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