

Impact of barrier discharge on water spray formation

Saveliev A.S.^{1,®}

¹ Joint Institute for High Temperatures of the Russian Academy of Sciences, Izhorskaya 13 Bldg 2, Moscow, 125412, Russia

® fisteh@mail.ru

The direction of plasma physics associated with the so-called plasma activation of water has been actively developing [1]. When an electric discharge is ignited near the surface of water, active chemical components are produced and dissolved in the volume of liquid [2]. The following chemicals are of interest: ozone, hydrogen peroxide, nitrogen oxides [3]. When these active compounds are added to water, it can be disinfected, decolorized, and purified from certain types of pollutants [2]. Since active compounds usually decompose quickly, the efficiency depends on the surface area of the water with which plasma comes into contact. It seems more efficient to create an electric discharge in dispersed water: in bubble water or in an aerosol [2]. The results of measuring the properties of water spray obtained using a swirl nozzle in the presence of an electric field and barrier discharge plasma in the air are presented. The parameters of water spray droplets were measured using the direct shadow method. Spatial distributions of averaged spray parameters (average diameter, Sauter mean diameter) were experimentally obtained in cases with and without discharge. The distributions were integrated to determine the spatially averaged parameters. The data obtained indicate that the effect of the electric field consists not only in changing the trajectory of droplets, but also in accelerated disintegration of the liquid film near the nozzle outlet.

- [1] Jiang B, Zheng J, Qiu S, Wu M, Zhang Q, Yan Z and Q X 2014 *Chem. Eng. J.* **236** 348–368
- [2] Thagard S and Locke B 2018 *Advanced Oxidation Processes for Water Treatment. Ed. by Stefan M.I.* (London: IWA Publishing)
- [3] Theepharaksapan S *et al.* 2024 *IEEE Trans. Plasma Sci.* **52**(7) 2392–2402