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Experimental investigations of electrodeless streamer inception¹

ANNA CHVYREVA, Eindhoven University of Technology, THOMAS CHRISTEN, ABB Switzerland Ltd., Corporate-Research, A.J.M. PEMEN, Eindhoven University of Technology — Experimental investigations of surface streamer discharges were performed to analyze the conditions of surface streamer inception and determine the important parameters of discharge propagation over a dielectric. The present work is devoted to electrodeless streamer inception in an arrangement typically used in an industrial high voltage device. The process of discharge propagation was investigated under AC and pulsed voltage supplies. The main focus of the work was to determine the velocities of streamer propagation over a dielectric surrounded by nitrogen or air environment. These propagation velocities were estimated by means of time-resolved imaging and current measurements of discharge processes. Other important characteristics of pre-breakdown discharge behavior (such as electric field required for the inception and the values of ionization rates) were obtained. Results demonstrate the influence of a dielectric surface on a process of discharge development; the differences between streamers propagating along a dielectric surface in nitrogen and air environment are analyzed and characteristic parameters are compared to discharge development in bulk gas.

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