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Micro-Plasma Discharges From Charge Rollers in Print Engines[1]
JUN-CHIEH WANG, University of Michigan, NAPOLEON LEONI, HENRYK BIRECKI, OMER GILA, HP Research Labs, MARK J. KUSHNER, University of Michigan — Conductive charge rollers (CR) are components in print engines of, for example, laser printers for charging of photoconductor (PC) surfaces. The charging results from an atmospheric plasma produced between the biased CR and the PC. During charging, the PC behaves like a perfect insulator with a conductivity $< 10^{-15}/\Omega\cdot$cm. The charging process is essentially that of a dielectric-barrier-discharge. If operated with a dc or quasi-dc voltage, the discharge is terminated by surface charges on the PC. The charging process is continuous as the CR and PC surfaces move at speeds of tens to hundreds of cm-s^{-1}. The discharge is then reignited as the voltage drop between the CR and incoming uncharged surface of the PC rebounds. In this investigation, multi-dimensional computer modeling of the CR to PC charging process has been conducted. The computer model, *nonPDPSIM*, solves transport equations for charged and neutral species, Poisson's equation, and the electron energy conservation equation for electron temperature. A Monte Carlo simulation is used to track sheath accelerated secondary electrons and the energy of ions incident onto surfaces. Radiation transport is included. We found that the applied voltage waveform and material properties of CR are important to operation. The uniformity of surface charges on the PC is sensitive to the material properties and speed of the moving surface. Parametric results for uniformity of charging of the PC will be discussed.

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