Nanoscale Discharge Electrodes for Greener Corona Discharges: Lower Inception Voltage and Minimized Ozone Emission

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***Abstract*— The size of discharge electrode to a large extent determines fundamental electrical characteristics, plasma properties, and ultimately the device performance for a corona discharge between a given air gap. Stable atmospheric corona discharges from nanomaterials are demonstrated using horizontally suspended carbon nanotubes (CNTs) or vertically-oriented graphene (VG) sheets as the discharge electrode. Compared with the conventional discharges employing micro- or macroscale electrodes, the corona discharge from CNTs or VG could initiate and operate at a much lower voltage due to the small electrode diameter, and is thus energy-efficient. Furthermore, the corona discharge from nanomaterials features a lower electron number density and a thinner corona plasma layer that can lead to significantly less detrimental ozone production and thus is environmentally friendly. This study has important environmental implic! ations for manufacturers of indoor corona discharge devices, such as electrostatic precipitators, photocopiers, and laser printers, to follow federal regulations for ozone emission.**