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# Two-dimensional modelling of dielectric barrier discharges using charge simulation technique-theory against experiment

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## Abstract:

This study is aimed at calculating the discharge onset voltages and power loss of the AC discharge using the charge simulation technique in a wire-cylinder reactor with a dielectric barrier at atmospheric pressure and room temperature. The calculation of the discharge onset voltages is based on the criterion of self-sustained growth of onset streamers and Trichel pulses in positive and negative half cycles, respectively. The emission of ions (space charges) from the wire surface is assumed to take place when the magnitude of the surface charge exceeds the corresponding onset values based on pre-defined discharge onset voltages for both positive and negative half cycles. The space charges are displaced by the prevailing electric field until accumulated on the glass surface. Discharge power loss corresponds to the energy required for the displacements of emitted space charges. The calculated values of the discharge onset voltage and power loss agreed reasonably with those measured experimentally.

## Keywords:

onset voltage, space charges, dielectric barrier discharges, charge simulation method, wire-cylinder DBD reactor

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