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MULTI-TERM BOLTZMANN MODELS: ENGINEERING TOOLS FOR THE PULSED POWER COMMUNITY

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Abstract. Boltzmann's equation (BE) has a rich and decorated history as a powerful tool for the mathematical treatment of basic transport processes. For many decades, the BE has been employed to better understand electron transport in low temperature plasma (LTPs) and discharges. Over the years, the BE has grown from a basic science tool, to an applied science tool, and is now a powerful engineering tool in many communities (e.g. semiconductor fabrication), while still retaining strong presence in the basic and applied sciences. In spite of this history, the BE continues to have a mystical reputation among many in the engineering community. The pulsed power community is one such example.

This talk will introduce the topic of pulsed power and challenges and opportunities for BE-based modeling to advance state-of-the-art pulsed power capabilities. Some of these topics represent basic of capabilities within the BE community but have the potential to transform the future of pulsed power systems. The first topic discussed is the ability to predict the breakdown voltage of any combination of gases for which a complete set of cross-sections already exist. Secondly, the derivation of a new set of cross-section data from measured swarm parameters using a genetic algorithm is reviewed. The final topic of this talk is breakdown anomalies in pulsed power systems, which at present, are very poorly understood. This talk concludes with the question "Can the BE, an inherently deterministic transport model, be adapted or complemented to predict statistical anomalies observed in breakdown strength in gas insulated systems?".

References

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