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An Integrated Approach to Understanding Electric Breakdown

Wednesday 13 August 2025 16:00 (2 hours)

Our approach to the physics of vacuum arcs, which limits many technologies, has been to model rf breakdown in vacuum in four stages (trigger, ionization, evolution and damage), then generalize the model, filling in details with data from other fields, such as accelerator design, power transmission grid limits, large tokamaks, sample failures in atom probe tomography and thin film sputter coating systems. The immediate goal is to understand surface damage and the probability of future breakdown events. We have found that thermal contraction of the cold surface and surface tension flattening can explain clusters of crack junctions giving field enhancements on the order of 200 on otherwise inactive cold surfaces. We also find a combination of surface tension and Maxwell stress during arc evolution can produce an unstable liquid surface at high electric fields that explains the time structure of the arc and many aspects of surface damage seen in breakdown data. We describe the mechanisms, existing data and experiments which should be useful for refining models and producing a self consistent, widely applicable model of gradient limits.

Please consider my poster for contributed oral presentation

Yes

Would you like to submit this poster in student poster session on Sunday (August 10th)

No

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

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