Contribution ID: **8** Type: **oral**

Stochastic Model of Breakdown Nucleation under Intense Electric Fields

Thursday, 23 March 2017 12:00 (30 minutes)

We propose a model in which breakdowns in a metal, subject to a strong electric field,
are driven by dislocations in the crystal structure.
The model is formulated using the density of mobile dislocations in the metal,
which is described using a stochastic model detailing multiplication and arrest,
leading to a fluctuating population at a metastable point with explicit probability for a critical transition.
We claim that such a transition can lead to the formation of critical nuclei for a cathodic spot,
leading to full breakdown.
The model is studied using numerical dynamic simulations and stochastic analysis.
We show good agreement between the numerical simulations and the analytical approximate solution for the mean breakdown times.
The probability for this transition increases with applied field, up to a critical field at which breakdown is immediate.
These results are compared to experimental observations, and can be used to predict additional behavior of such systems.

Type of contribution

Oral

session

Modelling and Simulations

Primary author: ENGELBERG, Eli (HUJI)

Co-author: ASHKENAZY, Yinon (The Hebrew University of Jerusalem (IL))

Presenter: ENGELBERG, Eli (HUJI)

Session Classification: Modeling and simulations

Track Classification: Modeling and simulations