## 15th Workshop on Breakdown Science and High Gradient Technology (HG2023)



Contribution ID: 12

Type: Poster

## The Effect of Combined Thermal Stresses and Electric Fields on the Formation of RF Breakdown Precursors

Tuesday, 17 October 2023 17:00 (2 hours)

The occurrence of breakdown events is a primary limiting factor for future accelerator applications aiming to operate under high field-gradient environments. Experimental evidence often leads to a hypothesis that breakdown events are accompanied by elevated temperature and dark current spike due to high asperity nano-structure formation which significantly enhances the local electric field. However, the mechanistic origin of such field enhancement under typical operational fields and joule heating conditions remains poorly understood.

In this work, we built a model describing the evolution of a typical copper surface driven by a electric field and temperature spikes. Implementing a mesoscale curvature-driven diffusion model, we identify the critical regimes where electric fields and thermo-elastic driving forces combine to lead to the spontaneous formation of sharp surface features. These regimes strongly resonate with previous experimental findings on breakdown of copper electrodes, suggesting surface diffusion to be a strong candidate for breakdown precursor formation mechanism.

Primary author: SHINOHARA, Ryo (Los Alamos National Laboratory, Michigan State University)

**Co-authors:** Dr SOUMENDU, Bagchi (Los Alamos National Laboratory); Dr PEREZ, Danny (Los Alamos National Laboratory); Dr SIMAKOV, Evgenya (Los Alamos National Laboratory); Dr BARYSHEV, Sergey (Michigan State University)

Presenter: SHINOHARA, Ryo (Los Alamos National Laboratory, Michigan State University)

Session Classification: Poster Session