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1P21 - Submicroscale Gas Breakdown as a Function of Cathode Protrusions

Monday 24 June 2019 13:00 (1h 30m)

Nano- and microscale surface features can have drastic impact on field enhancement and work function, altering field emission from the material. This can significantly change gas breakdown voltage for microscale gaps at atmospheric pressure [1], where field emission drives breakdown rather than Paschen's law. This presentation reports the nanofabrication of surface feature protrusions [2] and assessment of their impact on field enhancement and breakdown. Nanoscale devices with gaps ranging from 10s to 100s of nanometers were constructed to simulate individual surface protrusions. The devices were made of gold layered onto silicon wafer material to yield nanoscale and microscale gaps with protrusions of various aspects ratio to assess the impact of protrusion shape on field enhancement, as previously reported theoretically [2]. We report DC breakdown of these nanogaps at atmospheric pressure and discuss extensions to other pressure conditions.
[1] S. Dyanko, A. M. Loveless, and A. L. Garner, "Sensitivity of modeled microscale gas breakdown voltage due to parametric variation,"Phys. Plasmas, vol. 25, 2018, Art. no. 103505.
[2] J. Lin, P. Y. Wong, P. Yang, Y. Y. Lau, W. Tang, and P. Zhang, "Electric field distribution and current emission in a miniaturized geometrical diode,"J. Appl. Phys., vol. 121, no. 24, 2017, Art. no. 244301.
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