



Contribution ID: 759

Type: Poster

1P08 - Investigation of Electron Emission Characteristics of Multi-finger Ferroelectric Trigger Source for Pseudospark Switch

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

State of the art low pressure cold cathode pseudospark switches (PSS) for high pulsed power applications require special kinds of trigger electron source, which possess long life, reliable, durable, uniform electron emission, economical, etc. [1-4]. A high dielectric (dielectric constant ~ 2000) ferroelectric based trigger source is one of the best suited trigger mechanism for the PSS [2-4]. In this paper electron emission and breakdown characteristics of the ferroelectric trigger source has been presented for the generation of required trigger electrons for fast, low jitter and reliable switching. Electrodes with different finger tips and PZT ferroelectric dielectric disc has been analyzed. The electrical and optical diagnostics of ferroelectric trigger source have been performed to analyse electron emission and breakdown characteristics at different operating parameters, such as, gases and pressures, voltages, resistors and inductors. Electrostatic and plasma simulation studies have also been performed to investigate the electric field lines and electron emission processes. An electric field ~ 107 V/cm in vacuum as well as in gases has been observed between the tips of the electrode and ferroelectric disc. The emission characteristics are strongly dependent on the gases, pressures, voltages and resistances. It is showing better emission characteristics ~ 30 A at higher pressure ~ 60 Pa in case of helium and hydrogen gases for 1 k Ω resistance while in case of argon and nitrogen gases at comparable lower pressure ~ 10 Pa, ~ 20 A emission current has been observed for 20 k Ω resistance.

References:

- [1] K. Frank, et al., IEEE Trans. Dielectr. Electr. Insul., vol. 14, pp. 968–975, 2007.
- [2] H. K. Dwivedi, et al., IEEE Trans. Plasma Sci., vol. 30, pp. 1371-1375, 2002.
- [3] V. Pathania, et al., IEEE Trans. on Dielectric Elec. Ins., vol. 22, pp.3299-3304, 2015.
- [4] R. P. Lamba, et al., Plasma Sources Sci. Technol., 27, 035003, 2018.

Author: PAL, Udit Narayan (CSIR-Central Electronics Engineering Research Institute, Pilani, India)

Co-authors: Mr VERMA, Mohit Kumar (Electrical Engineering Department, National Institute of Technology (NIT), Calicut-673601, India); Mr MEENA, B. L. (Microwave Devices Area, CSIR- Central Electronics Engineering Research Institute (CEERI), Pilani, Rajasthan-333031, India); ., Varun (CSIR- CEERI, Pilani, India and AcSIR, Ghaziabad, India); Mr DHAKAR, Ajeet Kumar (Cyber Physical System Area, CSIR- Central Electronics Engineering Research Institute (CEERI), Pilani, Rajasthan-333031, India)

Presenter: PAL, Udit Narayan (CSIR-Central Electronics Engineering Research Institute, Pilani, India)

Session Classification: Posters Fundamental Research and Basic Processes and Power Electronics

Track Classification: 1.1 Basic Phenomena;