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Ultrahigh charging of small spherical grains by the beam–plasma method for creating a compact neutron source

Vladimir B Karalnik
Troitsk Institute for Innovation and Fusion Research (SRC RF TRINITI), Russia

Generation of high-voltage high-current electron beams in a low-pressure (0.1-1 Torr) gas discharge is studied experimentally as a function of the discharge voltage and the sort and pressure of the plasma forming gas. The density of the plasma formed by a high-current electron beam is measured. Experiments on ultrahigh charging of micro-particles exposed to a pulsed electron beam with an energy of up to 25keV, an electron current density of higher than 1 A/cm^2, a pulse duration of up to 1μs, and a repetition rate of up to 1 kHz are described. Spatial evolution of an electron beam in the course of its propagation towards the target is investigated. A numerical model of ultrahigh charging of grains with a radius of 250μm exposed to a high-energy electron beam is developed. The formation of high-energy positive ions in the electric field around of spherical targets is calculated. The calculations performed for a pulse-periodic mode demonstrate the possibility of achieving neutron yields about $10^9 s^{-1}$ in the case of 103 spherical grains.

Biography

Vladimir B Karalnik was graduated from Moscow Institute of Physics and Technology, USSR, in 1990. He received the PhD degree in Physics and Mathematics in 2008 from SRC RF TRINITI. He is currently a Leading Research Scientist with SRC RF TRINITI. His research interests include gas discharge physics and numerical calculations of non-equilibrium plasma interacting with gaseous, liquid and solid objects. He has published more than 90 papers in reputed journals.

karalnik_vb@triniti.ru

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