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3P72

3-DIMENSIONAL SIMULATIONS OF BREAKDOWN USING THE VORPAL SOFTWARE TOOL*

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We show simulations of rf breakdown phenomenon in waveguides and at waveguide-plasma interfaces. High gradient induced breakdown in waveguides is studied with self-consistent field emission, ionization cascade, and secondary models. We will test DSMC (Discrete Simulation Monte Carlo) particle-based algorithms for use in dynamic modeling of neutral gas in breakdown events. We investigate different initial conditions and breakdown initiation scenarios, to test their ability to generate breakdown plasma, and we track the plasma evolution in order to compare behavior to laboratory observations. Breakdown at the interface between dielectric-loaded waveguides and edge plasmas are also investigated. Here we are interested in the effect of power level, waveguide orientation, magnetic field, edge plasma and neutral density, on the breakdown plasma evolution.

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3P73

ENHANCEMENT OF HRP BINDING ON PLASMA TREATED ULTRA-HIGH MOLECULAR WEIGHT POLYETHYLENE

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Immunoassay technique is one of the actively researched areas since reliable, low cost and sensitive diagnostic immunoassay systems are required for public health care. The enzyme-linked immunosobent assay (ELISA) is common technique to detect diseases such as HIV or hepatitis virus. The aim of the present work is to modify the surface of ultra-high molecular weight polyethylene (UHMWPE) by plasma immersion ion implantation to increase the number of the specific active enzyme binding sites on the polymer surface. The specimens are incubated in horseradish peroxidase (HRP) overnight and washed by 10mM PO4 buffer six times. The quantity of HRP can be changed by adding TMB (HRP's substrate) on the polyethylene surface. The optical densities of the treated and untreated samples are monitored and compared. Our results show more active HRP on the plasma-treated PE. In addition, our tests show highly stable and reproductive results and demonstrate that plasma immersion ion implantation is a viable technique.