

4 - 20 Low Temperature Plasma Design and Optimization Based on Plasma Fluid Model

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Low temperature plasma has become an essential tool for the surface treatment of SRF cavities due to its rich variety of active particles, such as electrons, ions, and free radicals. On the one hand, we have mastered the plasma optimization strategy inside SRF cavities, including the plasma electrodes' design and plasma distribution (Fig. 1). On the other hand, the evolutionary laws of active particles in plasma have been studied (Fig. 2), and successfully explain the decay mechanism of hydrocarbons in SRF cavities. These findings have already provided a valuable reference for the cleaning and coating of SRF cavities.

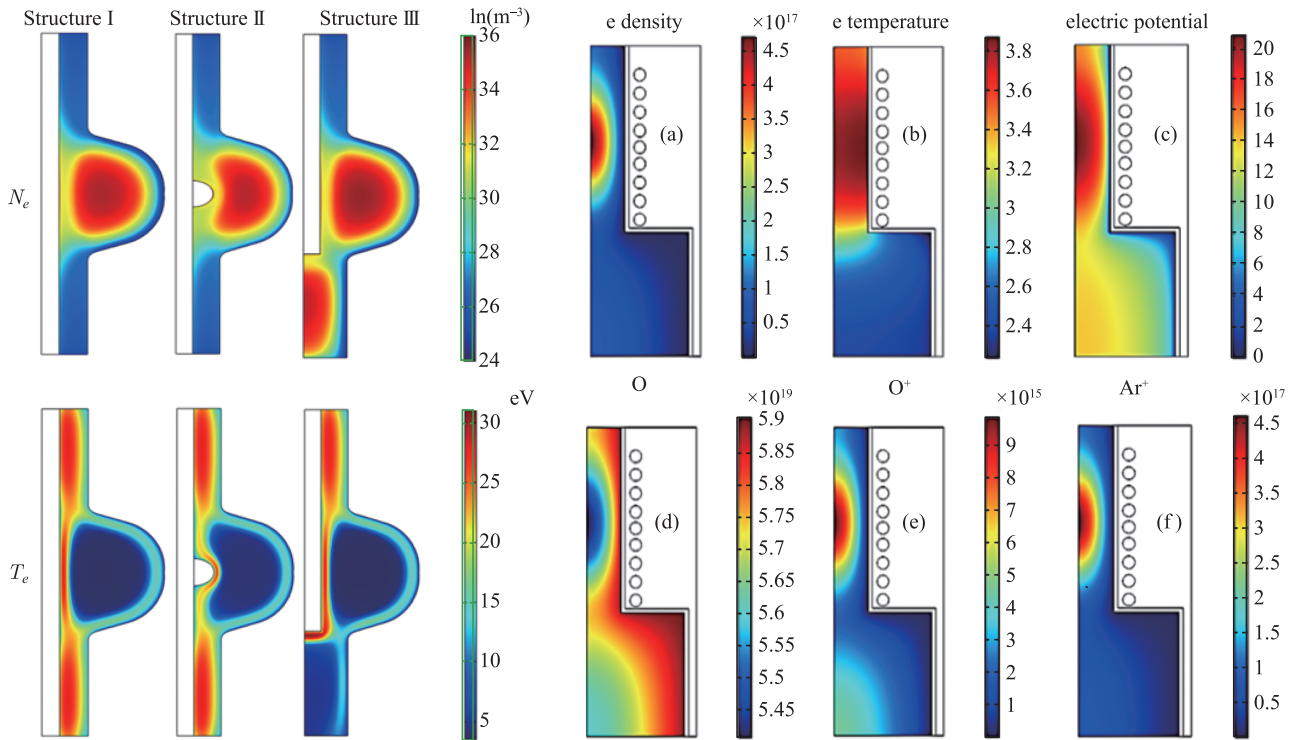


Fig. 1 (color online) Electron density (first row) and electron temperature (second row) in the single-cell cavities of electrode structures I, II, and III.

Fig. 2 (color online) The spatial distribution of (a) electron density [m^{-3}], (b) electron temperature [eV], (c) electric potential [V], (d) O atom density [m^{-3}], (e) O^+ ion density [m^{-3}], (f) Ar^+ ion density [m^{-3}], at 100 W, 4.5 Pa, 2.9% oxygen ratio.