

# Effect of cage bias and electron emission on the two-electron temperature groups in a hot cathode discharge

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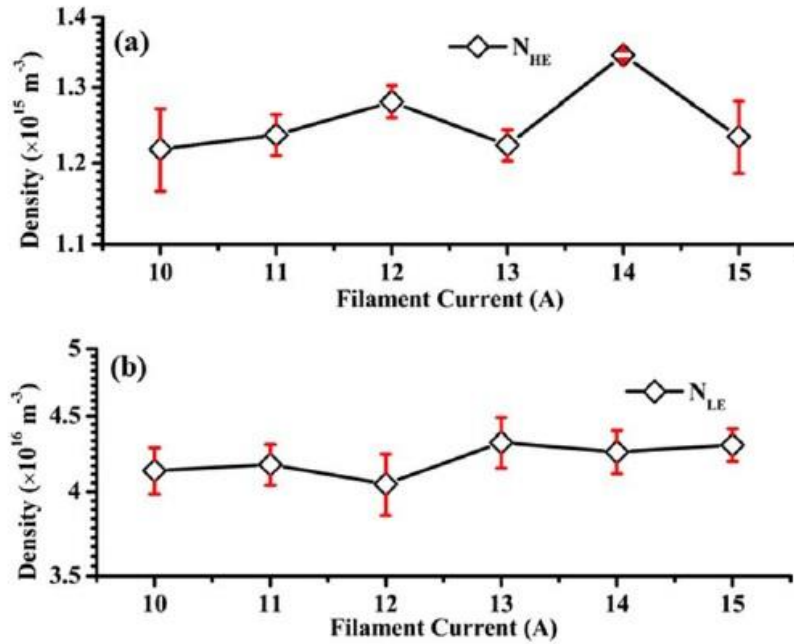


Fig. Variation of (a) high energy electron density and (b) low energy electron density when an accelerating voltage of 10 V is applied between the auxiliary filaments and the wall of the chamber and the auxiliary filament current is varied gradually at a magnetic cage biasing voltage of +40 V.

Electrons with higher energy are used for the production of reactive species in the plasma which are necessary for reactive plasma etching and the cold electron component is useful for the deposition of the thin film. In the target multipole magnetic cage of the double plasma device, where the plasma diffuses through the magnetic filter after its production in the source region, the effect of the cage biasing, introduction of auxiliary filament and accelerating voltage on the control of the temperature and density of the two-electron groups in a hydrogen bi-Maxwellian plasma is carried out. This control of the electron groups in turn will help to enhance the negative ion density also. In the absence of biasing voltage, the density of low-energy electrons and high-energy electrons were of the orders  $10^{14} \text{ m}^{-3}$  and  $10^{12} \text{ m}^{-3}$  respectively. As the cage is biased negatively, these values increased to an order of  $10^{16} \text{ m}^{-3}$  and  $10^{13} \text{ m}^{-3}$  respectively. The introduction of an auxiliary electron source in the target region together with the application of an accelerating voltage along with biasing voltage further increased the density of low-energy electrons to  $4 \times 10^{16} \text{ m}^{-3}$ .

Source: *Physica Scripta* 98 (2023) 075608.

<https://iopscience.iop.org/article/10.1088/1402-4896/acdda4>