Abstract Submitted
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Numerical study of the influence of faraday shield on RF neutral beam ion sources[1] ZHEN-HUA BI, YI HONG, LU LIU, YANG ZHANG, WEN YAN, YING SONG, DONGPING LIU, School of Physics and Materials Engineering, Dalian Nationalities University, PLASMA PHYSICS AND NANOMATERIALS ANALYSIS GROUP (PPNAG) TEAM — A high-density RF ion source is an essential part in neutral beam injector. In high power discharge status, RF ion source will suffer from ultra-high heat flux and ion irradiation. It will reduce the service life of the source reactor. One possible way to solve this problem is to introduce a water-cooled faraday shield, which could effectively protect the dielectric lateral wall from the heat load of the plasma. The faraday shield generally shapes as a cage like grid structure to avoid the eddy current. However, it will also harm for the coupling effect between the source power and plasma. To study this effect, a 3D fluid model is introduced to investigate the plasma parameters basing on the RF inductively coupled plasma (ICP) reactor with faraday shield behavior. Fluid equations are solved by COMSOL Multiphysics software. H2 is taken as the working gas. Due to the limitation of the fluid model, the pressure is taken as 5 Pa so the H negative reactions are omitted in this study. The simulation results show that, when the faraday shield shapes from optically open to optically close, the plasma peak density decreases, while the spatial distribution has less influence.

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