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Plasma sheath with multi-species of positive ions and surface produced negative ions

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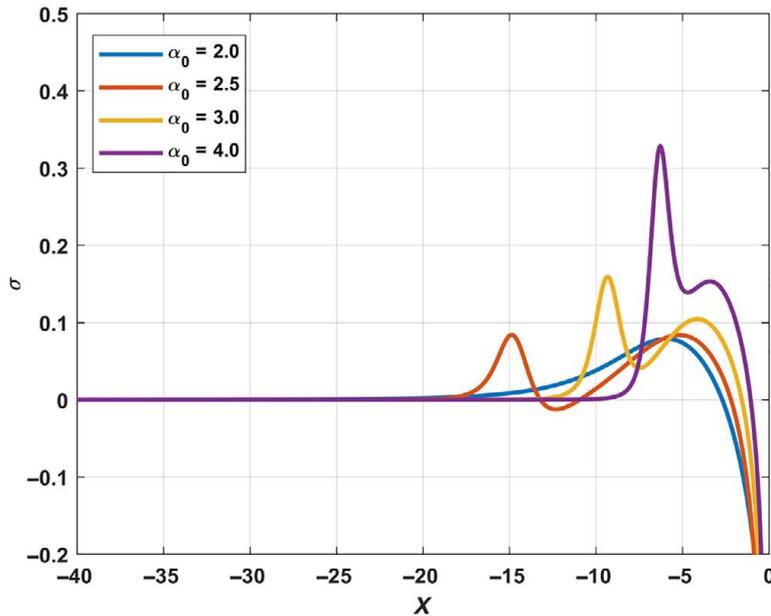


Figure Caption: Spatial variation of space charge density ($\sigma = N_i - N_e$) at different electronegativity parameters within the plasma sheath. Right hand side is taken as the wall, while the left hand side is the sheath edge.

The structure of a plasma sheath has been investigated using a simple theoretical model for Hydrogen negative ion sources in front of a Caesium-coated metallic plate. Besides the presence of electrons, the plasma is composed of multi-species of positive ions along with surface and volume produced negative ions. There is a critical value of volume electronegativity that determines the shift from electropositive to electronegative sheath. At a low volume electronegativity, volume negative ions do not have enough energy to penetrate within the sheath; consequently, space charge profile remains independent. The situation is altered beyond a critical electronegativity. Spontaneous development of a virtual cathode is also observed. Additionally, the surface production of negative ions has been found to be inhibited by the presence of a second positive ion, such as Ar^+ , which is non participating in H^- production.

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