Use of electron emissive probe in electronegative plasma

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Electron emissive surfaces in plasmas display the ability to decay the sheath, which leads to the possible use of emissive probes at high electron emission for direct measurements of the plasma potential. This apparent closing of the floating potential of the emissive probe to the plasma potential can, however, be inhibited by the space-charge limitation mechanism and other kinetic effects. We have performed an experimental study regarding this in our Linear magnetized plasma device (LMPD) based on our previous theoretical and simulation results, e.g. [1], showing that the difference between the floating potential of a highly emissive probe and the real plasma potential is, in fact, highly dependent on the ratio between the temperature of the emitted electrons and the temperature of the bulk electrons. Due to the limited possibility of raising the temperature of the thermionically emitted electrons from the probe, we have performed measurements in oxygen plasma, where most of the negative species population is represented by the negative ions. The reference data for plasma potential was obtained by making simultaneous measurements with a classical Langmuir probe and evaluating them using First derivative probe technique [2].