

## Plasma potential control in a weakly magnetized plasma column using negatively-biased emissive electrode

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The possibility to control plasma parameters such as the density  $n$ , the electron temperature  $T_e$  or the plasma potential  $V_p$  is of crucial importance for applications (for instance plasma centrifuges [1]). We present an extensive investigation of the influence of a hot and negatively-biased emissive electrode on the plasma parameters of a pre-existing magnetized plasma column.

Experiments using a negatively-biased emissive electrode were conducted in an Argon plasma column [2] at pressures  $p_0$  around 1 mTorr and magnetic fields  $B \sim 20$  mT. The 10 cm in diameter plasma column is created by an RF source (power  $P_w$  from 1 to 3 kW) resulting in ionization rates up to 20%, while the biased emissive electrode faces the opposite side of the column. The cathode is biased at a fixed potential  $V_b$  up to  $-60$  V (i.e.  $\sim 20 T_e$ ) and heated at temperatures  $T_k$  up to 2900 K.

A comprehensive dataset spanning the parameters space ( $p_0$ ,  $B$ ,  $P_w$ ,  $V_b$  and  $T_k$ ) was obtained with measurements of density and electron temperature using an advanced triple probe, and plasma potential measurements using emissive probes.

A typical example (Fig. 1 with  $V_b = -60$  V) shows that electron emission is an efficient mean to control the plasma potential: as the temperature of the cathode  $T_k$  increases, the cathode sheath reduces, allowing to control the value  $V_p$  from the external bias  $V_b$ . Our dataset is interpreted in light of recent models [3, 4], and refinements of these models will be discussed.

### References

- [1] R. Gueroult *et al.* *Phys. Plasmas* **26**, 043511 (2019)
- [2] N. Plihon *et al.*, *J. Plasma Physics*, **81**, 345810102 (2015)
- [3] G. Liziakin *et al.*, *Plasma Sources Sci. Technol.* **29**, 015008 (2020)
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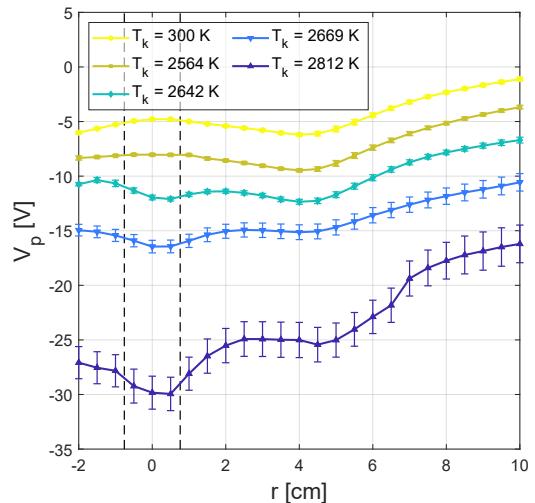


Figure 1:  $V_p$  along  $r$  with various temperatures  $T_k$ .  $r = 0$  is the center of the column, dashed lines indicate the electrode.