

Abstract Submitted  
for the GEC15 Meeting of  
The American Physical Society

**Analyzing spotless mode of current transfer to cathodes of Cr, Gd, and Pb vapour arcs**<sup>1</sup> LARISSA BENILOVA, MIKHAIL BENILOV, Departamento de Física, CCCEE, Universidade da Madeira and Instituto de Plasmas e Fusão Nuclear, IST, Universidade de Lisboa, Portugal — Diffuse mode of current transfer occurs on cathodes of vacuum arcs if the average cathode surface temperature is high enough, which can be achieved by placing the (evaporating) cathode into a thermally insulated crucible. It is shown that in the case of Cr or Pb cathodes the usual mechanism of current transfer to arc cathodes cannot sustain current densities of the order of  $10^5 - 10^6 \text{ Am}^{-2}$  observed in the experiment, the reason being that the electrical power deposited into electron gas in the near-cathode space-charge sheath is too low. It is hypothesized that the electrical power is supplied to the electron gas primarily in the bulk plasma, rather than in the sheath, and a high level of electron energy at the sheath edge is sustained by electron heat conduction from the bulk plasma. Estimates of the current of ions diffusing to the sheath edge from the quasi-neutral plasma gave values comparable to the experimental current density, which supports the above hypothesis. On the contrary, the spotless attachment of vacuum arcs to Gd cathodes may be interpreted as a manifestation of the usual arc cathode mechanism. Results given for Gd cathodes by a model of near-cathode layers in vacuum arcs conform to available experimental information.

<sup>1</sup>Work supported by FCT of Portugal through the projects PTDC/FIS-PLA/2708/2012 and Pest-OE/UID/FIS/50010/2013.

Larissa Benilova  
Departamento de Física, CCCEE, Universidade da Madeira and  
Instituto de Plasmas e Fusão Nuclear, IST,  
Universidade de Lisboa, Portugal

Date submitted: 15 Jun 2015

Electronic form version 1.4