Abstract Submitted
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Modeling and simulation of emitter effects at cathodes in high intensity discharge lamps[1] ANDRE BERGNER, FRANK SCHARF, JUERGEN MENTEL, Ruhr University Bochum, Germany — The temperature of tungsten cathodes in high intensity discharge lamps may be kept down by reducing the work function ϕ. This can be accomplished by an atomic dipole layer on the electrode surface made of a certain emitter material, e.g. thorium. If the emitter material is deposited by an ion current, ϕ will be reduced mainly in the center of the arc attachment area. This local reduction may cause a constricted arc attachment, called emitter spot. The power balance of the arc cathode can be simulated using the power flux density and current density as boundary conditions [1]. Both are functions of ϕ and the local cathode surface temperature. The emitter spot is simulated in accordance with experimental results [2] by a superposition of transfer functions for $\phi = 4.55\,\mathrm{eV}$ and $\phi < 4.55\,\mathrm{eV}$, weighted in dependence on temperature.

[1] S. Lichtenberg et al. Phys. D: Appl. Phys. **38** (2005) 3112–3127.
[2] G. Kühn et al., Phys. Rev. **E** 75, 016406 (2007).

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