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Low work function HPM graphite cathodes coated with alkali and alkaline-earth elements and compounds[1] J.H. BOOSKE, University of Wisconsin, V. VLAHOS, D.D. MORGAN — Cesium-iodide (CsI) coated graphite cathodes have demonstrated superior emission characteristics particularly attractive for High-Power-Microwave (HPM) applications [1]. While the CsI layer appears to enhance cathode performance, its role at the nano-scale level remains unknown. In order to understand the electron emission physics of this system, an ab initio molecular physics study has been carried out on the surface work function modification of a clean graphite basal surface coated by thin adsorbent layers. The effects of both Cs and Ba monolayers on a semi-metallic (graphite) surface have been studied, as well as their ionic compounds CsI and BaO. It is shown that both pure Cs and Ba over-layers interact with and consequently lower the surface work-function of graphite in a way analogous to what has been observed for alkali metals chemisorbed on metallic surfaces [2]. On the other hand, CsI and BaO ionic compounds interact with the graphite surface in different ways depending whether the cation or anion is relaxed closest to the surface. The underlying fundamental mechanism responsible for lowering the work function appears to be essentially identical for all configurations. [1] D. Shiffler, et al., Phys. Plasmas Vol. 11 (2004) 1680. [2] P. Soukiassian, et al., Phys. Rev. B. Vol. 31 (1985) 4911.

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John Booske
University of Wisconsin

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