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Formation of the Cs-Sb- Si ternary interface studied in-situ X-ray Photoelectron spectroscopy

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Abstract

The use of multi-alkali antimonides for fabrication of photocathodes used in image intensifier tubes has prompted several surface science studies of monolayer adsorption and desorption of alkali metals on various surfaces. In this study we report on the adsorption and desorption studies of Cs and Sb on Si (111) probed by X-ray photoelectron spectroscopy in UHV. The uptake curve of Cs on bare Si (111) shows a Frank van der Merwe growth mode at very low flux rates. However in forming the ternary interface such as Cs-Sb-Si, it appears that island growth is predominant. The desorption curve shows a surprising result that Sb desorbs at lower temperature than Cs, which suggests a stronger Cs-Si bond. Attempts to cap the Cs Islands by Sb are being made. The studies of the change in work function, secondary electron emission and Fermi level changes are also presented and correlated to the adsorbate morphology. Evidence for forming cesium antimonide is also provided.