Surface Freezing in Binary Liquid Gold-Silicon Alloy\textsuperscript{1} OLEG SHPYRKO, ALEXEI GRIGORIEV, REINHARD STREITEL, PETER PERSHAN, Physics Department and DEAS, Harvard University, Cambridge, MA 02138, BEN OCKO, Brookhaven National Laboratory, Upton, NY 11973, MOSHE DEUTSCH, Bar-Ilan University, Ramat-Gan 52900, Israel — We present experimental x-ray studies of formation of a 2D solid monolayer at the liquid-vapor interface of AuSi eutectic alloy above bulk melting point $T_{\text{melt}} = 363^\circ C$. Additionally, at temperature $T = T_{\text{melt}} + 12^\circ C$ the 2D surface-frozen layer undergoes a solid-solid surface phase transition. Surface-induced atomic layering structure normal to the surface was found to be significantly enhanced for low-temperature 2D phase (layering length $\approx 3$ nm), while reverting to classical layering length of $\approx 1$ nm above surface transition temperature. The Gold-Silicon eutectic is the first miscible binary metallic system for which such surface freezing behavior has been observed.

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