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Surface Freezing in Binary Liquid Gold-Silicon Alloy[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 $T_{melt} = 363°$C. Additionally, at temperature $T = T_{melt} + 12°C$ 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 ≈ 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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