

Abstract Submitted
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Novel Phase Separation for Pb/Ge(111) SHIRLEY CHIANG, YU SATO, University of California Davis, NORMAN BARTELT, Sandia National Laboratories Livermore — Using low energy electron microscopy (LEEM), we have elucidated the phase diagram for the growth of Pb on Ge(111). As Pb is deposited on Ge, the Pb atoms substitute into the top layer, causing released Ge atoms to form into $c(2 \times 8)$ adatom islands, with the size and density of these Ge islands controllable by the substrate temperature. During the reversible β (dense $(\sqrt{3} \times \sqrt{3})R30^\circ$) to (1×1) phase transition, we discovered a novel phase separation mechanism. Above the 1.33ML saturation coverage of the β phase, a sharp first order phase transition is observed near 295C. For Pb coverage just < 1.33 ML, the phase transition is no longer sharp, with β and (1×1) phases coexisting and the transformation occurring from 232C to 181C. Reducing coverage by ~ 0.01 ML causes a dramatic change, with small domains of the new phase appearing and disappearing, due to fluctuations between the two phases. Additional domains appear and fluctuate until the whole surface is completely transformed. We attribute the fluctuating domains to thermal fluctuations of the density of Pb atoms within a domain. By comparing LEEM images of the β and (1×1) phases during the phase transition between $[\alpha + (1 \times 1)]$ and $(\alpha + \beta)$, the Pb coverage of the (1×1) phase at the eutectic point was determined to be ~ 1.29 ML.

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