Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Convective Atom Transport as a Modifier of Near-Surface Alloy Composition YONG W. KIM, Lehigh University — Thermophysical properties of metallic alloys are manifestly the features of a given material specimen, and, as such, they are dependent on their elemental composition. Some properties are measured at surfaces and others are measured through the bulk as a whole. Complications arise when the elemental composition becomes position dependent within a material specimen. Such occurrences turn out to be common and have been demonstrated by simultaneous measurements of thermal diffusivity and elemental composition by time-resolved spectroscopy of laser-produced plasma (LPP) plume emissions. To further understand the cause, we have investigated the evolution of near-surface composition of Wood's alloy (composed of 50 W% bismuth, 25W% lead, 12.5 W% tin and 12.5W% cadmium) as a model system under the influence of thermal cycling with, and without, temperature gradient over the specimen. Surface composition modification has been found to take place by accumulation of irregularly spaced gray patches of inhomogeneous composition on the surface in the presence of temperature gradient. Surface position and depth-resolved determination of elemental composition by LPP spectroscopy has revealed fully 3-D composition structures of the patches. Candidate mechanisms will be discussed.

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Date submitted: 20 Nov 2006 Electronic form version 1.4