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**Combined HRTEM and Auger spectroscopy evidence for the existence of grain boundary premelting in nickel-doped tungsten** JIAN LUO[1], SMSE and COMSET, Clemson University, VIVEK K. GUPTA, DANGHYOK YOON[2], SMSE, Clemson University, HARRY M. MEYER III, HTML, Oak Ridge National Laboratory — A combined high resolution transmission electron microscopy (HRTEM) and Auger spectroscopy study has revealed the formation of 0.6 nanometer thick, nickel-enriched, "liquid-like" grain boundary (GB) films in Ni-doped W specimens at 95C below the bulk eutectic temperature where the bulk liquid phase is no longer stable [Appl. Phys. Lett. 87, 231902 (2005)]. The stabilization of subeutectic liquid-like grain boundary cores in this model two-component metallic alloy is phenomenologically analogous to the long-sought phenomenon of grain boundary premelting. Despite various macroscopic indications of GB structural transitions, this result, to our knowledge, is the first direct evidence for the existence of such disordered nanostructures at metallic GBs. This observation offers a new explanation to the long-standing mysterious solid-state activated sintering mechanism, where accelerated sintering is attributed to the enhanced diffusion in liquid-like GB layers. This discovery also provides insights to resolve several long-standing controversies, e.g., the mechanisms of Ni-induced abnormal grain growth and GB embrittlement.

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