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## Effects of Nb and Ta Additions on the Strength and Coarsening Resistance of Precipitation-Strengthened Al-Zr-Sc-Er-Si Alloys

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### Abstract

A dilute Al-0.07Zr-0.02Sc-0.005Er-0.06Si (at.%) alloy was microalloyed with 0.08 at.% Nb or Ta. Atom-probe tomography reveals that, upon aging, Nb and Ta partition to the coherent L1<sub>2</sub>-Al<sub>3</sub>(Zr,Sc,Er) nanoprecipitates (with average concentrations of 0.14 and 0.09 at.%, respectively), with both segregating at the matrix/nanoprecipitate heterophase interface. This is consistent with the Nb- and Ta-modified alloys exhibiting, as compared to the unmodified alloy: (i) higher peak microhardness, from a higher nanoprecipitate volume fraction and/or lattice parameter mismatch; and (ii) improved aging resistance, from slower nanoprecipitate coarsening due to the small diffusivities of niobium and tantalum in aluminum. Analogous results were previously reported for a V-modified alloy.

**Keywords:** Aluminum alloys; Precipitation strengthening; Coarsening; Microhardness; Atom-probe tomography

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