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CHARACTERIZATION OF THE EARLY STAGES OF PHASE SEPARATION BY ATOM PROBE TOMOGRAPHY

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Atom probe tomography provides a unique real space experimental tool to characterize the earliest stages of phase separation in metal systems. In the three-dimensional atom probe, the x, y, and z coordinates and the mass-to-charge ratio and hence the identity of the atoms in a small volume may be determined with near atomic precision. From this information, the size, shape and composition of ultrafine features such as embryos and precipitates may be characterized. The early stages of decomposition have been characterized in an Fe- 1.1% Cu -1.4% Ni model alloy. The development of the copper-enriched regions into copper precipitates has been determined during isothermal ageing at 573 K and 673 K for times up to 10,000 h. In addition, the formation and growth of the secondary precipitates in the complex nickel based superalloy, Alloy 718, have been determined during isothermal ageing at 873 K. These secondary precipitates were found to be a mixture of the L12-ordered phase and the DO22-ordered phase.

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