Characterization of decomposition in bulk metallic glasses by atom probe tomography

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The distribution of the solute atoms in bulk metallic glasses in both the as-prepared and heat-treated conditions provides important information on the stability of the alloy and its decomposition processes. The three-dimensional atom probe (3DAP) is able to experimentally determine the spatial coordinates and the elemental identities of the atoms with near atomic resolution so that their distribution within small volumes of the specimen can be reconstructed in three-dimensions. These atom probe data can be divided into small volume elements that can be statistically analyzed to detect and quantify concentration fluctuations due to phase separation, precipitation and crystallization. The 3DAP data can also be analyzed to determine the local atomic configuration of each atom type and thereby estimate the tendency for solute clustering and chemical short range order. Ultrafine decomposition can also be detected in the field ion images by contrast variations and by the ring patterns characteristic of crystalline phases. A review of the decomposition of a number of different types of bulk metallic glasses that have been investigated by atom probe tomography will be presented.

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