

Optimizing Microstructures in Light Weight Alloys for Enhanced Performance

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The application of the principles of materials engineering, through thermo-mechanical processing, has resulted in the development of very attractive combinations of properties in a number of light weight alloy systems. This is particularly so in the case of aluminium and titanium alloys. In this presentation, the mechanisms of evolution of microstructures in these alloys will be compared and contrasted, and new insights of the role of non-classical nucleation theory, involving the influence of compositional fluctuations and the tendency for phase separation, will be presented. The role of vacancy supersaturations on nucleation processes will also be addressed. It will be shown that while the mechanisms of microstructural evolution may differ in these two alloy systems, a number of the deformation mechanisms are similar. The interrelationship between microstructure and mechanical properties will be discussed, and progress being made in the prediction of these relationships will be described.