The ideal properties of a structural material are light weight with extensive strength and ductility. A composite with high strength and tailorable ductility was developed consisting of nanocrystalline AA5083, boron carbide and coarser grained AA5083. The microstructure was determined through optical microscopy and transmission electron microscopy. A technique was developed to determine the nitrogen concentration of an AA5083 composite from secondary ion mass spectrometry utilizing a nitrogen ion-implanted standard. Aluminum nitride and amorphous nitrogen-rich dispersoids were found in the nanocrystalline aluminum grain boundaries. Nitrogen concentration increased as a function of cryomilling time up to 72hrs. A greater nitrogen concentration resulted in an enhanced thermal stability of the nanocrystalline aluminum phase and a resultant increase in hardness. The distribution of the nitrogen-rich dispersoids may be estimated considering their size and the concentration of nitrogen in the composite. Contributions to strength and ductility from the Orowan relation can be more accurately modeled with the quantified nitrogen concentration.

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The public is welcome to attend.