

NSF Grant Number: DMI-9714321

Program: MPM

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Title: A Novel Manufacturing Process for Lightweight Alloy Composites

•Research Objectives:

To develop a novel manufacturing technology for fabrication of discontinuously reinforced aluminum alloy composites with high quality while low cost.

•Approach

Melting the alloy at high temperature under inert atmosphere;
Bubbling reactive gaseous precursor such as CH₄, N₂, and NH₃ through the alloy melt;
Controlling temperature, gas flow rate, composition and other kinetic parameters to form the desirable reinforcements in the alloy melt.

•Broader Impact:

Research showed that in-situ formation of lightweight alloy composites using in-situ method is feasible.
This method may be used for manufacturing of aluminum alloy composites with low cost and superior properties.

•Significant Results:

SiC and AlN particle reinforced aluminum alloy composites were synthesized in-situ by gas-bubbling method with CH₄, N₂, and NH₃ as the gaseous precursors.

The reinforcing particles were in small size and uniformly dispersed in the composites.

Thermodynamic and kinetic models were developed for understanding the mechanism of reinforcement formation.

•Graphic:

