# Master Thesis Project

Integrating Graphene Related 2D Nanomaterials into Metal Matrix

Background

Metal matrix composites (MMCs) served as an interesting research area for development of high-performance materials, offering distinguished physical, mechanical, thermal, and electrical properties. These properties of MMCs have led to their vast applications in aerospace, automotive, infrastructure, electronics, and precision devices. In comparison to pure metals and monolithic alloys, the resulting MMCs have been demonstrated with higher specific strength, improved hardness, enhanced thermal conductivity, better wear resistance, and improved damping capacity.

Graphene is a two-dimensional (2D) nanosheet formed by a monolayer of carbon atoms tightly packed into a honeycomb sp^2 lattice. The thickness is only 0.34 nm. After discovery, it has gained tremendous attention from scientific community due to its outstanding structural, electrical, thermal, and optical properties. The unique structures and properties make graphene an ideal reinforcement material for improving structural and thermoelectrical performance of metal matrix composites; However, the practical application of graphene reinforced MMC has been hindered by the poor dispersion of graphene in metal matrix. It is challenging to realize the uniform distribution of graphene in the metal matrix.
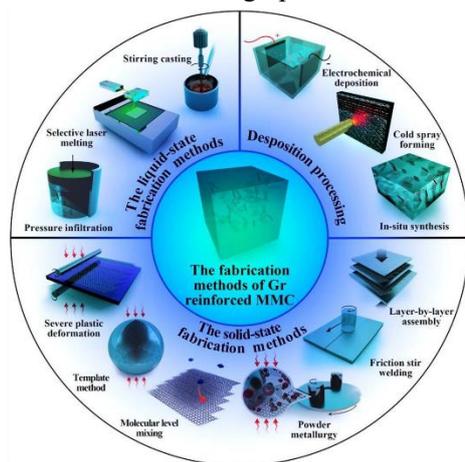
The fabrication methods of graphene reinforced metal matrix composites.
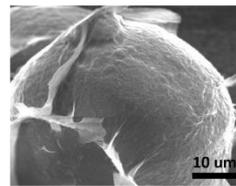
SEM image of Graphene coated metal particles.
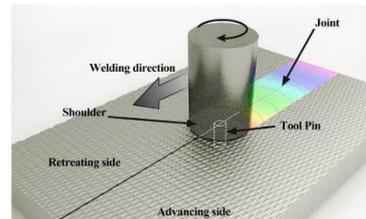
Schematic diagram of friction stir welding.

Objectives

- To use our recently developed method to uniformly coat graphene on different micrometer sized metal particles, for example steel, nickel, and titanium alloy.

- After successfully preparing the graphene reinforced metal matrix composite by you, the mechanical properties, anticorrosion and/or tribological performance will be systematically investigated with closed collaboration with Swedish companies, such as ABB.

- The correlation between the performance and the properties of Graphene reinforced MMC will be studied by a series of characterization methods, for example, SEM, Raman, XRD etc.

- You will be able to learn and know the entire fabrication process and the final applications as well.

Applications and Contact:

If you are interested in the project, please send your CV and a short letter to us as soon as possible.

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