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# Stable, High Concentration Dispersions of Pristine Atomically Thin Metal Diboride Sheets in Organic Solvents and Aqueous Solutions

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Metal diboride nanomaterials have recently garnered interest due to their promising applications. Theoretical treatments have predicted that these boron compounds could provide novel electronic properties and in some cases, electrical conductivity that exceeds that of carbon nanotubes. Additionally, these materials are likely to exhibit extreme temperature resistance, high hardness, and resistance to erosion, corrosion, and chemicals. These types of materials are ideal for applications under extreme conditions, such as the aerospace industry, armor, and electrodes. However, the development and adoption of metal diboride nanomaterials are hindered by serious challenges with respect to sintering, thermodynamic stability, and surface modifications during dispersion. Therefore, there is a need for a simple and effective technique to create high-performing metal diboride nanomaterial.

Researchers at Arizona State University have invented a method for the synthesis of two-dimensional nanosheets of pristine metal diboride materials. This is the first time that the synthesis of atomically thin metal diboride nanosheets has been possible without the hindrance of surface modifications. Previous synthesis techniques for such films have resulted in surface modifications, which altered the material composition and chemical properties, thus limiting effective application. However, the choice of organic solvents and the mixing parameters for this method allow for the formation of these films without surface modifications. This new class of two-dimensional nanomaterials has potential applications in superconductors, ultrahigh temperature ceramics, low weight/high strength armor, transparent conductors, electrodes, and chemically stable drug delivery vectors.

Potential Applications

- Aerospace
- Armor
- Coatings
- Electrodes
- Conductors and superconductors
- Pharmaceuticals

Benefits and Advantages

- Innovative – A simple process that results in the first demonstration of pristine metal diboride nanosheets.
- Ideal for extreme conditions - Materials may exhibit high temperature

resistance, high hardness, high conductivity, and resistance to chemical damage.

- Highly conductive – Ideal for superconductors and electrodes.

For more information about the inventor(s) and their research, please see

Dr. Alexander Green's directory webpage