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Electrorheologically Micro- or Nano-Organized Composite Materials

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Intellectual Property Status:

Patent Pending

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Background

3-D composite materials are highly sought after for many industrial applications. Current 3-D materials, such as pre-impregnated substrates and 'fuzzy' textiles, offer limited performance improvements, especially in thin-sheet structures. In particular, the creation of composite materials with substantially improved out-of-plane performance has remained elusive.

Invention Description

Researchers at Arizona State University have developed an innovative method for creating high-strength, low-weight composite sheet materials with three-dimensional inner structural alignment. The technology utilizes electrorheological techniques to align fibers or particles in a resin. The resin is then cured, preserving the internal structure. The resulting composite sheet materials can offer greater strength, higher impact resistance, unique electrical and chemical properties, or other advantages, depending on the choice of materials and processing variables. The technique allows for uniform, consistent manufacture, meeting the high-quality demands of military and aerospace applications. Additionally, it is suitable for use with a wide variety of resins, fibers, and particulate materials.

Potential Applications

- Body and Vehicle Armor
- Aerospace Components (e.g. Aircraft Skins)
- Fuel Cell Membranes
- Automotive Components

Benefits and Advantages

- **Improved Strength –** The composite materials have true 3-D internal structural alignment, resulting in substantially improved out-of plane shear and impact resistance.
- **Reduced Weight –** Less material is needed for similar performance, allowing volume and weight savings when these are at a premium.
- **High Volume** – The technique is well suited for high-volume manufacturing of sheet composites.