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Structurally optimized, double-double, metal-like laminate for lightweight fabrication

Researchers at Stanford have developed a composite material that mimics the structural characteristics of metal, with the added benefits of laminates.

Fabrication with durable materials is essential for manufacturing of many composite structures, such a vehicles, airplanes and satellites. Traditionally, these have been fabricated using aluminum due to its durability, but composite laminates would provide a lighter, more cost-effective solution. Despite this, composite laminates, have been difficult to apply due to their complex, non-homogenized nature.

Now, the Tsai lab at Stanford has proposed a novel double-double laminate design to overcome the challenges of traditional composites. This design enables perfect homogenization, eliminating shear- and stretch-bend coupling. Consequently, it improves upon metals by offering lighter weight, higher stiffness, and better possibilities for tapering. As a result, the double-double laminate solves problems of complexity and sub-optimal outputs associated with previous composites.

Stage of Development

Proof of concept

Applications

- Reduced weight and cost of composite structures
    - Medical devices and prosthetics
    - Automotive and aerospace industry
    - Industrial machinery and equipment
    - Space and satellite compositions

    - High-performance sport equipment
    - Infrastructure and civil engineering

Advantages

- Lighter than metals
- More durable than metals
- Higher stiffness than metals
- Better tapering due to orthotropic nature of ply
- Cheaper than metals

Innovators

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