

English Abstract:

Manufacturing and characterization of anisotropic syntactic foams

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Syntactic foams are composite materials made by embedding hollow or porous particles into a matrix material. Syntactic foams have significant potential in applications such as in the automotive, aerospace, and marine industries, where lightweight materials that can stand high loads are deeply important. They have been used in structural components such as in fuselage panels in aircraft and submarine hulls due to their structural integrity under high pressure.

Syntactic foams are usually isotropic, which means they respond to stress in the same manner from all directions. However, in some applications, anisotropic response can be advantageous. This research investigates the development of syntactic foams with anisotropic properties, specifically focusing on their fabrication and mechanical properties.

In this study, parallel hollow metal rods were used as the reinforcement. During manufacturing, the hollow rods were positioned parallel to each other and structured in sheets. In order to structure the rods, paraffin wax was used as a temporary placeholder to keep the rods in the specific orientation before being burned out at 250C. The ends of the rods were fixed to the mold and were infiltrated with the matrix material, resulting in the syntactic foam. We investigated the compressive properties of this new type of material and compared its performance with different types of syntactic foams from the literature.