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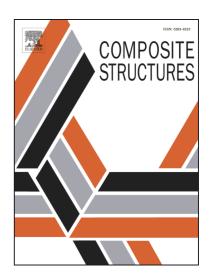
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High-power laser resistance of filled sandwich panel with truss core: an experimental study

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Abstract We reported a new function of sandwich panels with truss cores, i.e., superior
performance under intense local heat flux induced by continuous wave laser. To further enhance
the laser resistance, lightweight ablative material and thermal insulation material are filled in the
sandwich panel respectively. A dimensional analysis is developed to find core filler materials
with appropriate properties. Experiments show that sandwich panels filled with the compound
of silicone resin and carbon powder, a typical ablative material, and porous ceramic, a typical
thermal insulation material significantly improve the local heat flux resistance compared with
monolithic plates and unfilled sandwich panels. The full-field temperature history and dynamic
damage evolution of the back surface are recorded and compared, and the failure time to reach
the melting point is prolonged in the following order: monolithic plate, unfilled sandwich panel,
sandwich panel filled with ceramic, sandwich panel filled with the compound of silicone resin
and carbon powder. Considering the lightweight design requirement of such structures,
resistance in relation to specific weight is also evaluated and discussed.

Keywords laser resistance, sandwich panel, thermal insulation, lightweight structure, failure point

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