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Healing of a glass fibre reinforced composite with a disulphide containing organic-inorganic epoxy matrix

W. Post[1], A.M. Cohades[2], V. Michaud[2], S. van der Zwaag[1], S. J. García[1*]

[1]*Novel Aerospace Materials Group, Faculty of Aerospace Engineering, Technical University of Delft, Kluyverweg 1, 2629 HS, Delft, The Netherlands*

[2]*Laboratory for Processing of Advanced Composites (LPAC), Ecole Polytechnique Fédérale de Lausanne (EPFL), Station 12, CH-1015 Lausanne, Switzerland*

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Abstract

We report the development of an intrinsic healing glass fibre reinforced polymer (GFRP) composite based on a disulphide-containing organic-inorganic thermoset matrix. Thermomechanical experiments showed that the newly developed matrix has a combination of a Young's modulus value in the range of (800-1200 MPa), the ability to multiple thermally induced healing delamination (70-85°C), and processability by conventional vacuum infusion process that is not yet reported in literature. The composite mechanical properties and the extent of healing were determined by flexural, fracture and low-velocity impact testing. Small sized (<cm^2) damage could be partially healed multiple times using a minimal healing pressure to ensure a good alignment of the damaged interfaces. The level of healing can be enhanced, even for large (>cm^2) damage, by increasing the healing pressure provided the location of the primary damage is concentrated within the matrix phase. The polymer matrix composite introduced here represents a significant step forward from the often mechanically inferior intrinsically self-healing composites towards structural self-healing composites.