

Computational Modeling of Polymer Matrix Composites

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Applications of polymer matrix composites are growing in aerospace and offshore industries due to the light-weight and good mechanical properties of composite materials. The design of composite materials can be made at macroscopic level in which the composite mechanical properties can be tailored to offer the most desired performance of composite structures. Understanding on mechanical behavior of the composite material may require detailed investigations at the microscopic level involving the behaviour of the composite constituents such as the fiber, the polymer matrix and the fiber/matrix interface under macroscopic loads. Composite failure criteria are often employed to evaluate the failure of composite material and its constituents. Computational damage models can be then developed to reflect the stiffness reduction of the material once damage at the macro- and micro- scales of the composite is indicated. The successful prediction of composite structures relies on consistent computational models which can capture the mechanical behaviour of composite materials at different length scales.

This talk attempts to provide an overview of physic-based computational models based on damage mechanics and fracture mechanics for failure analysis of composite structures. Application of computational models are demonstrated through different problems including analyses of double-notched composite laminates under tension, aerospace structures under impact loading and composite risers under deepwater environment.

References

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