PROGRESSIVE DAMAGE ANALYSIS (PDA) AND MECHANISM BASED FAILURE PREDICTIONS OF COMPOSITES

TRACK NUMBER (100 - FRACTURE, DAMAGE AND FAILURE MECHANICS)

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Key words: Instructions, Minisymposium, Computational Mechanics, Composite materials, Progressive damage

ABSTRACT

From molecular dynamics to simulation of large scale structures, capability of simulation tools for composite materials has come a long way over the past decade. However, much of composite materials/structural analysis methods used in industry today are still limited to linear analysis or simplified failure analysis. The primary reason for which is that composite materials exhibit very complex failure mechanisms, which is still quite out of reach for methods employed thus far. Complexity is compounded by numerical issues like mesh dependency, non-linear behavior, multi-scale phenomena, simplified assumptions, etc. The aim of this mini-symposium is to bring together researchers in the field of composite material/ structure progressive failure analysis methods to have an open discussion on current and future methods for progressive damage analysis of composites.

We invite papers in the following, but not limited to, topics in the general theme of progressive damage analysis of composite materials.

- Hi-Fidelity analysis methods that reproduce physical failure mechanisms.
- Lo-Fidelity analysis methods that produce "effective" failure mechanism.
- Multi-scale progressive damage analysis.

- Issues with PDA. E.g.; Mesh size effect, mesh alignment errors, stress calculation errors using FEM, etc.

With application to items below (not limited to):
- Composite material allowable prediction.
- Composite structure failure prediction.
- Progressive damage analysis of composite joints.
- Progressive damage analysis of architecture composites (textile, 3D printed).

To provide focus, the material system in consideration will be limited to composite materials currently in use in aerospace, automotive and wind energy, namely carbon composite, glass composite, aramid composite, and ceramic composites. Preference will also be given to methods validated using experimental data; however, the focus of the paper should be on the analysis.