

On the enhanced ductility of 3D composites under compressive loading

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3D NOOBED (3D Non-interlacing Orthogonally Orienting and Binding) composites are a relatively new class of composites. The technique to produce these composites was first presented by Khokar [1]. Despite a slightly reduced stiffness, these composites show some improved behavior. For example in compression, these composites can be loaded up to 10% strain [2]. Compressive failure of these types of composites is characterized by kink bands that can reflect within tows, as illustrated in the SEM picture in Figure 1. In order to analyze this behavior, a 3D meso-scale model is developed. In this model, plastic deformation of the fiber-bundles is modeled by means of a crystal plasticity model to preserve the orientation of the fibers within the tows. A simulation displaying these kinks can be seen on the right in Figure 1. The model is suitable for parameter studies and it is found that the meso-scale model can capture the formation of reflective kinks. Furthermore, the model is able to describe the compressive stress-strain response accurately.

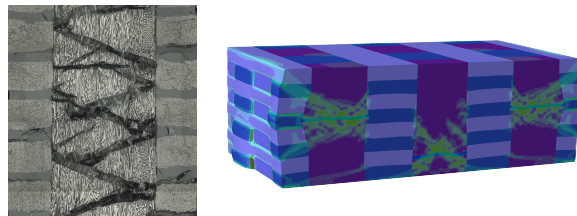


Figure 1: A SEM image of reflective kinking can be seen on the left. An overlay plot of the finite element model and strain contours on the right.

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