Thermo-Oxidative Damage Evolution in a Composite Lamina by using Peridynamics

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Surface oxidation degrades the durability of polymer marix composites operating at high temperatures due to the presence of strong coupling between the thermal oxidation and structural damage evolution. The mechanism of oxidation in polymer matrix composites leads to shrinkage and damage growth. The thermo-oxidative behavior of composites introduces changes in diffusion behavior and mechanical response of the material. This study presents the derivation of peridynamic formulation for the thermo-oxidative behavior of the polymer matrix composites. As a demonstration, isothermal aging of a unidirectional composite lamina is considered by using peridynamics. It captures the effect of oxidation on damage growth and its propagation.