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Self-healing fiber-reinforced composite[1] MINWOOK LEE, Univ of Illinois - Chicago, SAM YOON, Korea University, ALEXANDER YARIN, Univ of Illinois - Chicago — In the present work two parts of the healing agent (commercially available epoxy resin and hardener) are encapsulated in separate polymeric nanofibers. The fibers are generated by a single-step dual coaxial solution blowing. The core-shell fibers with the diameters in the 200-2600 nm range are encased in the PDMS (polydimethyl siloxane) matrix to form a self-healing composite material. Under fatigue conditions, the core-shell fibers inside the composite material are ruptured and the healing agents released into the surrounding matrix. Various fatigue conditions including repeated bending and stretching are used to damage the composites and the degree of self-healing is quantified after that. Also, an incision resembling a crack is pre-notched and crack propagation is studied. It is found that the presence of the self-healing agents in the fibers significantly retards crack propagation due to curing by the epoxy at the ruptured site. The stiffness of the composites is also measured for the samples containing self-healing fibers inside them before and after the fatigue tests. A novel theory of crack propagation is proposed, which explains the observed jump-like growth of sub-critical cracks.

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