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Autonomic Healing of Polymers and Composites

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Inspired by biological systems in which damage triggers an autonomic healing response, structural polymers and polymer matrix composites have been recently developed that possess the ability to self-heal. Self-healing is accomplished by incorporating a microencapsulated healing agent and a catalytic chemical trigger within a polymer matrix. When the material is damaged, the microcapsules rupture and release the healing agent into the damaged region through capillary action. As the healing agent contacts the catalyst, polymerization is initiated and the damage is repaired. One promising healing chemistry based on the ring-opening-metathesis-polymerization (ROMP) of dicyclopentadiene and Grubbs' catalyst has yielded static fracture recovery in excess of 90% and greatly extended fatigue life. New healing chemistries and alternate healing approaches are explored with utility in a variety of structural polymer and polymer composite applications.

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