

Emerging Areas in Self-Healing Materials

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Abstract

Self-healing materials have emerged over the past decade as a major new research area in materials science and engineering. They promise more robust behavior, longer lifetime, increase safety, lower maintenance costs, and many other unique attributes attractive to industries from transportation to medicine to infrastructure. Since their inception in 2001, self-healing research has primarily focused on restoration of mechanical integrity in microcapsule-based systems, or in polymers with intrinsic self-healing functionality. A review of the state-of-art in self-healing materials will be presented along with translation of these same concepts to new functionalities. In particular, the use of microcapsules in Li-ion batteries for improved safety and longevity will be presented. Finally, the integration of vascular networks in structural composites will be described and initial results demonstrating unprecedented functionality from thermal management to self-healing to electromagnetic modulation.

