SELF-HEALING USING NANORODS

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The need to reduce energy costs has driven researchers to reconsider the design and fabrication of materials. Among these considerations is the need to fabricate materials that can self-heal with regard to mechanical damage.[1] This is also an important step in increasing the durability of these materials. Multilayer composites, which combine ductile polymers with brittle films, constitute vital components for optical communications, microelectronics and bioengineering applications.[2] However, formation of cracks is a critical problem in these materials. Designing systems that can respond to environmental changes and undergo self-healing without external intervention is a core component of energy efficient technologies. In these experiments, polyethylene glycol covered nanorods dispersed in a polymer matrix were found to migrate to cracks generated at the surface of a silicon oxide layer. Segregation of these nanorods to the crack was dependent on both the enthalpic and entropic interactions between the polymer and nanorods. The results of these experiments highlight the rather simple means of fabricating materials that can self-heal, thereby increasing the longevity of these materials while simultaneously saving energy.[2]

[1] White, S.R. et al. Automatic healing of polymer composites. Nature 409, 794-797 (2001)

[2] Gupta S, Zhang Q, Emrick T, Balazs A.C., Russell T.P., Entropy driven segregation of nanoparticles to cracks in multilayered composite polymer structures. Nature materials, 229-233 (2006)