ROOM TEMPERATURE HEALING OF A THERMOSETTING POLYMER USING THE DIELS-ALDER REACTION

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ABSTRACT

Self-healing materials are particularly desirable for load-bearing applications because they offer the potential for increased safety and material lifetimes. A furan-functionalized polymer network was designed that can heal via covalent bonding across the crack surface with the use of a healing agent consisting of a bismaleimide in solution. Average healing efficiencies of approximately 70% were observed.[1]

It has been previously shown that solvent amount and maleimide concentration play key roles in determining healing efficiency. Alternate maleimides and solvents have been investigated for their ability to heal. A comprehensive evaluation of variables effecting healing efficiency has been performed, focusing on the roles of swelling, surface conditions, healing agent structure, and relative concentrations of functional groups. Previous work on this system used modified compact tension specimens. In order to more effectively investigate these parameters, an alternative modified butt joint geometry was adopted. A schematic of this test method is shown in Figure 1.

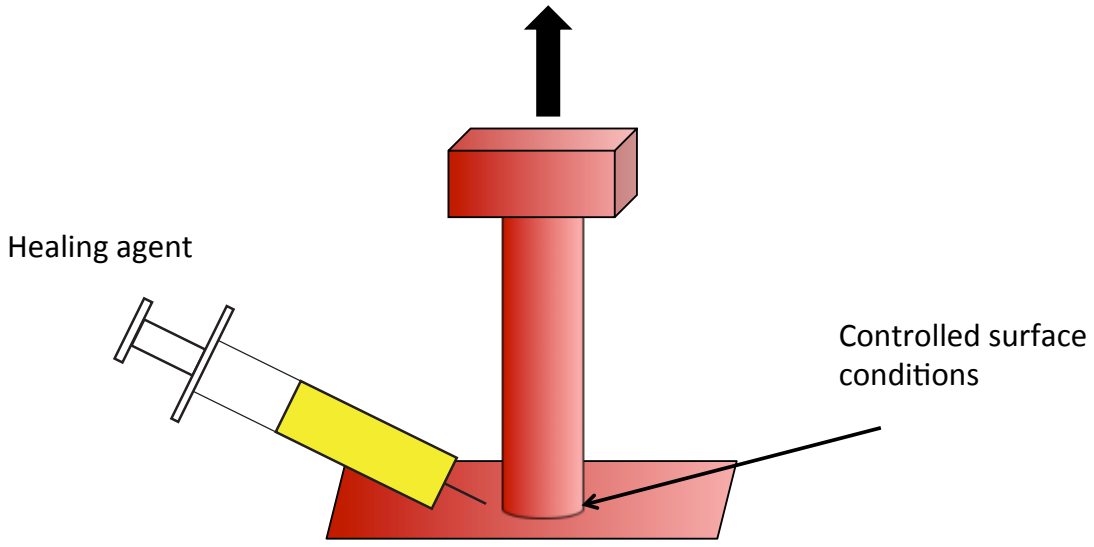

Figure 1: Test setup for evaluation of bismaleimide solution-induced bond formation.

This information will allow us to optimize healing efficiency of the system as well as to understand the relationship between diffusion and reaction that controls bond formation and physical interlocking across polymer sufaces. Additionally, methods of healing agent encapsulation have been investigated

so as to make this an autonomically healing system.

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REFERENCES

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