**Experiments on the focusing and use of acoustic energy to**

**accelerate polymer healing**

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This research seeks to use acoustic stress-wave time reversal to accelerate the self-healing tendencies of a polymer. This could be advantageous when used in hard-to-reach areas such as space where manual repair would be difficult. Studies to date include one dimensional time reversal experiments and the use of acoustic energy to accelerate the molding of an epoxy polymer mixed with a curing agent (the curing reaction can be considered analogous to self-healing process). Studies reported herein investigate the effect of focused acoustic energy at a mold discontinuity during curing, and experiments under time reversed focusing on crack sealing in polymer dog-bone specimens. Tensile testing is carried out in the latter tests to monitor sealing progress.

Epoxy Curing Tests

Tests have been conducted on a curing two-part epoxy, both with and without acoustic excitation. Cure progress is measured via vibration response.A fast Fourier transform is calculated, frequency and amplitude shifts are tracked, and it is by monitoring these that an epoxy’s cure status can be quantified. In recent tests, several variables have been eliminated or reduced and consistent results are being achieved. While these confirm that acoustic excitation does accelerate the cure process, further research is needed in order to define the associated material and operational prerequisites.

Crack Sealing Tests

The paper will also discuss results on iterative time reversal application on cracked nylon specimens mounted within a tensile testing machine and provided with transducers to enable time reversed focusing at the crack. Crack healing progress is monitored through continual measurement of the specimen’s stress-strain response.