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Magnetic Composites for Energy Storage Flywheels

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James E. Martin, Lauren Rohwer



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Poster Overview

- There is much interest in using magnetic materials for flywheels, either as a back iron for the electric motor/generator or as a lift magnet. But high performance energy storage flywheels are made of carbon fiber composites. These flywheels exhibit hoop strains of the order of 1-2% upon spin up, so materials joined to these flywheels must also be able to sustain such strains, and be as compliant as the flywheel itself, to avoid separation in use.
- Solid magnetic materials are not sufficiently elastically compliant, and would therefore separate from the flywheel during spin up. Composite magnetic materials can be made to be sufficiently compliant, but not at the high particle loadings needed to achieve the desired magnetic permeability. Our challenge is to develop methods of creating highly loaded particle composites in both thermosetting and thermoelastic polymers; determine through experiment and theory how their effective magnetic permeability depends on loading; and investigate their mechanical properties.
- We have developed materials that are self-healing with the application of pressure and heat, allowing fractures to heal during spin up.

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