



Recycling Expired Carbon Fiber Prepreg Material

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Background

- Target composite material: thermoset
- Aerospace industry: 56-70% of total prepreg waste stream [1]
- Current industry recovery methods: mechanical, thermal, and chemical



Figure 1. Thermoset carbon fiber prepreg [2]

Innovation

Recover the mechanical properties of expired aerospace grade prepreg by reverting the unidirectional material into fiber form.

Anticipated Impact

Potential benefits of recycling expired carbon fiber prepreg:

- Reduce the waste intended for landfills
- Lower energy requirement due to reusability
- Lower carbon footprint

Path Forward

The next step for this process is to create a novel bulk molded compound for material characterization.

Project Description

Proposed process:

- *Step 1*: Chop unidirectional prepreg into uniform rectangles of dimension ½" by ¼"
- *Step 2*: Combine chopped prepreg into beaker with methyl ethyl ketone (MEK) and mix using overhead stirrer
- *Step 3*: Once desired dispersion is reached distill MEK out of mixture for recycled use
- *Step 4*: Hot press mixed and dried prepreg to create coupon of material

Step 1

Step 2

Step 3

Step 4

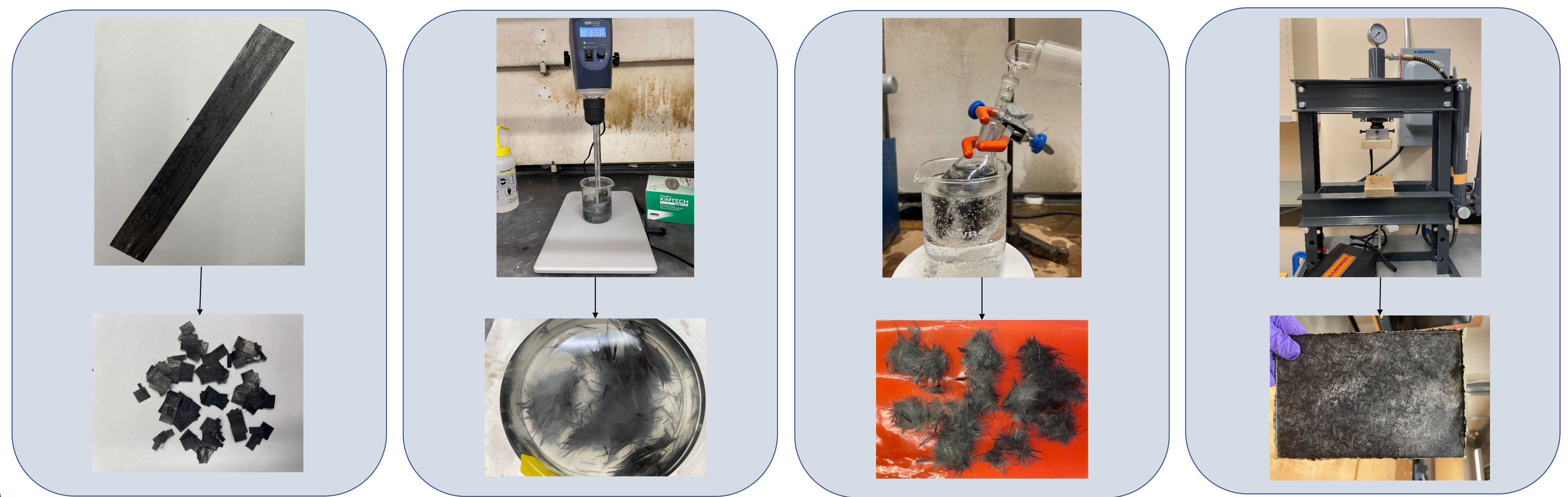


Figure 2. Four-step experimental process of reverting unidirectional material into fiber form to then create a compound of material

Possible Application

- Sheet molded compound production across multiple industries for finished parts
- Fabrication of discontinuous fiber composite material
- Injection molding of chopped carbon fiber prepreg material
- Utilize the conductivity of the fibers

References

- [1] Nilakantan, G., Nutt, S., Reuse and Upcycling of Thermoset Prepreg Scrap: Case Study with Out-of-Autoclave Carbon Fiber/Epoxy Prepreg, Journal of Composite Materials. 2018, 52, 3, 341-360.
- [2] "Home." Mitsubishi Chemical Carbon Fiber & Carbon Fiber Reinforced Plastics Special Site, <https://www.m-chemical.co.jp/carbon-fiber/en/product/prepreg/>.