

## ENHANCING THE SUSTAINABILITY OF HIGH PERFORMANCE FIBER COMPOSITES

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Key Words: sustainable, epoxy, composite, bio-based, recycling

Continuous fiber reinforced composites find widespread and increasing use in all manner of structural applications, from sporting goods to aircraft to wind turbine blades. They promise an attractive mix of high stiffness and strength and excellent corrosion resistance coupled with low weight that is difficult to match with more traditional materials. However, the bulk of these materials are based on petroleum-based thermosetting resins that cannot be recycled, calling into question their sustainability. This is of particular note given the rise of wind energy as a critically important form of sustainable power generation and the heavy reliance of this industry on composites in general and continuous fiber reinforced epoxy resins in particular.

It is with this in mind that our group has, for the last several years, pursued work on three fronts to address the aforementioned challenges. We have examined the structure-properties relations of a family of high-performing bio-based epoxy resins, and have demonstrated that it is possible to achieve levels of performance similar to those required in the wind energy sector<sup>1</sup>. We have studied the process rheology of these materials in the context of resin transfer molding (the preferred means of composite formation), developed a new method to quantify the amenability of an arbitrary resin to such processes, and have shown that the bio-based systems possess significant advantages as far as infusion times are concerned<sup>2</sup>. Finally, inspired by the seminal report of L. Leibler's group in 2011<sup>3</sup>, we have focused most recently on the ability to rework and recycle both epoxy resins and their composites, adding another dimension to our push for sustainability. This talk will present an overview of efforts in all three areas and provide an update on our most recent efforts.

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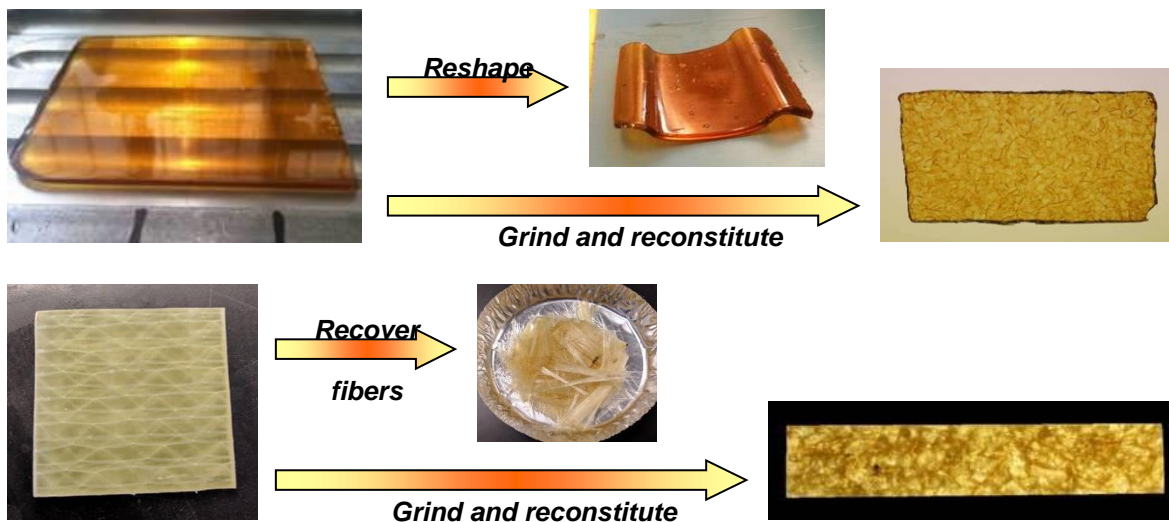


Figure 1 – Pathways explored for the reuse of high performance structural epoxy resins and their composites