

## **Drastically Reduced Waste Water Generation During Solution Spinning of PAN Fibers Using an Activated Carbon Sorption System**

**Ruben Sarabia-Riquelme, Emil Hochstrasser, E. Ashley Morris, David Eaton and Matthew C. Weisenberger**

*Center for Applied Energy Research, University of Kentucky, 2540 Research Park Dr., Lexington, KY 40511, USA*

Solution spinning is a widely used method for the fabrication of polymeric fibers such as acrylic textile fibers and carbon precursor fibers. The process generates immense amounts of waste water given that intense washing is needed to obtain the final solvent-free fiber. In fact, industrial spinning plants are often a major municipal water user in their area. Furthermore, the treatment of the waste water is costly, as it relies on distillation of the vast volume of waste water generated in order to recuperate the solvent and lower the waste water solvent concentration to levels that can be discharged into microbial ponds (typically less than 5 ppm).

In this work, a proof of concept system for the adsorption of dimethyl sulfoxide (DMSO) from water during poly(acrylonitrile) (PAN) carbon precursor fiber solution spinning has been developed. The system includes a water wash bath where fibers and water flow in counter-current followed by an activated carbon column where DMSO is adsorbed from the wash water before the water is returned to the wash bath. Using this system, we have achieved a fresh water usage reduction of up to 90% during fiber spinning. Thus, this system could greatly reduce the fresh water usage and waste water treatment costs of solution spinning industrial plants, while also reducing the cost to produce carbon fiber.