

Progress on the Development of Small Diameter Hollow PAN Precursor and Resultant Carbon Fibers

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Carbon fibers are utilized in a number of lightweight, strength-driven applications, including compression overwrapped pressure vessels for automotive onboard hydrogen storage. The PAN precursor oxidation reaction is known to be diffusion limited, resulting in a sheath-core morphology. Previous research indicates that the more-ordered sheath is responsible for carrying a larger fraction of load, rather than the more disordered core. We have developed a method for the production of hollow polyacrylonitrile (PAN) precursor and resulting hollow carbon fibers to capitalize on the ordered sheath formation. We propose that the use of hollow fiber can reduce cost, as well as part weight, and improve oxidation rate. Here, we are utilizing an arc-segmented multifilament spinneret (non-bore fluid) approach, to successfully form small diameter hollow PAN filaments via a solution spinning process. These filaments are then oxidized and carbonized. Progress on tensile properties in the context of fiber density are discussed. Results presented include precursor and carbon fiber tensile properties, density, and morphology.