

XI.7 Economical High Performance Thermoplastic Composite Bipolar Plates (STTR Phase I Project)

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Current fuel cell bipolar plate technology requires costly, time consuming fabrication steps that result in a high cost per unit energy. Typically, metallic-based materials are used, which are heavy and limited by corrosion and chemical resistance, and graphite-based materials, which are limited by mechanical strength and structural integrity. Composite materials have been recently investigated as a potential bipolar plate platform, but current technology is limited by two fabrication processes: (1) an expensive chemical vapor infusion process, and (2) a slow, expensive machining process to generate flow channels. This project will develop novel thermoplastic composite materials, along with a manufacturing process, produce composite material sheets that can be compression molded into high performance, mechanically robust bipolar plates. The resulting plates will be lightweight for reduced vehicle payload, have high mechanical strength for structural durability, and offer high electrical conductivity in both the in-plane and through-plane directions. The manufacturing process will eliminate the need for chemical vapor infusion and flow channel machining, resulting in a significantly reduced cost over current technology.