# Ceramic Tubular Products
partnered with
# Massachusetts Institute of Technology

## GA-17IN020106, Robust Silicon Carbide Cladding for LWR Application- Corrosion and Irradiation Proof Test of Low-Cost Innovations in the MITR

**YEAR AWARDED:** 2016

**TOTAL PROJECT VALUE:** $292K (DOE funds awarded, $233K; awardee cost share, $58K)

**STATUS:** Completed

**PRINCIPAL LAB INVESTIGATORS:** John Jackson (john.jackson@inl.gov)

**DESCRIPTION:** Under this voucher, MITR, a Nuclear Science User Facilities (NSUF) partner facility, received newly formulated silicon carbide (SiC) TRIPLEX cladding test specimens from Ceramic Tubular Products (CTP) and loaded the samples into irradiation test capsules. In January 2017, MIT placed the capsules into its test reactor for two full cycles of irradiation. After the specimens were removed, in June 2017, physical property measurements were performed to see what performance improvements could be found in the new cladding coating. Testing and examination revealed weight loss from the uncoated samples was higher than what would be acceptable in commercial service. Weight loss from the zircon-coated specimens also exceeded what would be acceptable for commercial service. The subject SiC fibers showed about the same amount of corrosion as those with the more traditional high Nicalon-S fibers, indicating either could be used in future commercial applications.

**BENEFIT:** The key physical properties measurements obtained by MIT on behalf of CTP represent a valuable data set that will be used by CTP to further perfect the TRIPLEX clad material and work toward commercial acceptance.

**IMPACT:** CTP has demonstrated the ability of its product to serve as Accident Tolerant Fuel cladding for current LWR nuclear power plants, with commercial demonstrations planned in the next few years as part of a joint DOE-industry program.

**NEXT STEPS:** CTP, in collaboration with Raytheon Technologies and Framatome Inc., has proposed a program of small-scale research and development that includes demonstrating brazing processes that produce joints that can stay robust under harsh neutron radiation and irradiation of SiC cladding assemblies in the MIT research reactor and Advanced Test Reactor (ATR) Water Loop. This will help form analytical models and the material property database required to support licensing of the cladding.