

Becq Radiation Shielding (Neutroelectric LLC)
partnered with
Oak Ridge National Laboratory

NE-20-23439, Combined Effects Testing of High-Temperature and Neutron Fluence to Support the Qualification of NE-300, a High-Temperature Neutron Shielding Material

YEAR AWARDED: 2020

TOTAL PROJECT VALUE: \$625k (DOE: \$500k, Becq: \$125k)

STATUS: Completed

PRINCIPAL LAB INVESTIGATORS: Jose' D Arregui-Mena (ORNL), Danielle Castley (Becq)

DESCRIPTION: The research characterized and performed an irradiation campaign to support the qualification of a polymer material created by Becq that is lighter than other types of shielding, easy and inexpensive to produce, and moldable into complex shapes. Becq and ORNL performed critical combined tests at ORNL's High Flux Isotope Reactor to demonstrate the performance of the material, develop a licensing case, and provide future customer confidence.

BENEFIT: Becq's high-temperature, lightweight neutron-shielding technology, NE-300, will help reduce costs and increase safety in the nuclear industry. The higher temperature resistance of 300 degrees C instead of 180 degrees C introduces significant opportunities for deploying neutron shielding materials in higher-temperature locations within the reactor containment and/or to improve the safety margin in applications originally designed for shielding with a lower operating temperature.

IMPACT: Neutron shields are used in numerous applications in the commercial nuclear industry worldwide to protect reactor components, nuclear workers, and the public from harmful exposure to neutron radiation. Lightweight neutron shields available in the market today are limited in their ability to withstand high-temperature environments, which has proven to be design-limiting for their use. Becq's vision is to become first-in-sales in the \$1 billion international neutron shield materials market over the next decade by becoming the dominant supplier to the commercial nuclear industry and expanding into the defense and space markets.

SIGNIFICANT CONCLUSIONS: The key differentiation of NE-300 over existing materials is a temperature resistance of 300 degrees C instead of 180 degrees C. NE-300's higher operating temperature introduces significant opportunities for deploying neutron shielding materials in higher-temperature locations within the reactor containment and/or to improve the safety margin in applications originally designed for shielding with a lower operating temperature. This irradiation campaign and project helped Becq to improve the manufacturing process used for the fabrication of the polymer.

NEXT STEPS: While NE-300 currently exceeds the requirements for many applications in the nuclear industry, the Innovation Crossroads program at Oak Ridge National Laboratory will allow Becq to perform the additional development necessary to validate the long-term use of this product and prepare it for commercialization.