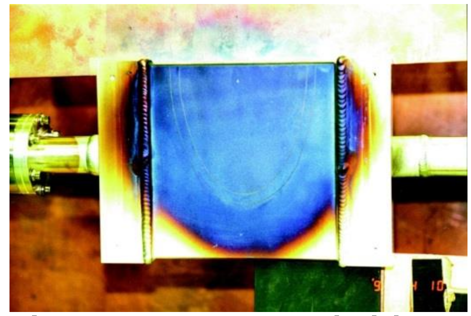
Summary of non-fusion R&D at Sandia funded through FES

RE Nygren 3jun2015

Until 2012, Sandia participated regularly in non-fusion R&D that was supported primarily through our collaborations with companies in the DOE program for Small Business Innovative Research but also in some work-for-others contracts. In this work, funds were recovered from collaborating institutions for the staff time and materials used, but FES had supported the facility itself and in doing so enabled the contributions to the non-fusion R&D below.

In collaborations for Boron Neutron Capture Therapy or BNCT, scientists at Sandia National Laboratories tested a photon beam stop for Lawrence Berkeley National Laboratory and BNCT targets for Linac Systems. The public benefit for this R&D is to further cancer research.

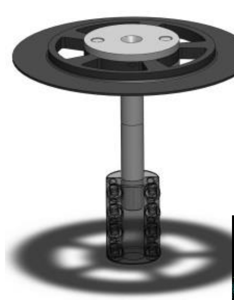

Aluminum BNCT target in high heat flux test at Sandia National Laboratories

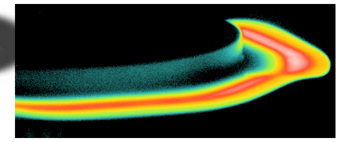
Scientists at Sandia National Laboratories tested a PEP-II photon beam stop for the Stanford Linear Accelerator Center. The benefit here was improved capability of the accelerator for scientific research and, indirectly for the public, the products of that research that accrue from this research.

On three occasions, scientists at Sandia National Laboratories tested beryllium windows for General Electric. These are used in X-ray diffraction tubes. The related public benefit is the use of these tubes in industrial, dental and medical applications.

Scientists at Sandia National Laboratories worked with Thermacore, Inc. in tests for the development of EUV plasma source electrodes. These have industrial application in electronics and the public benefit is improved capability for the microelectronics industry.

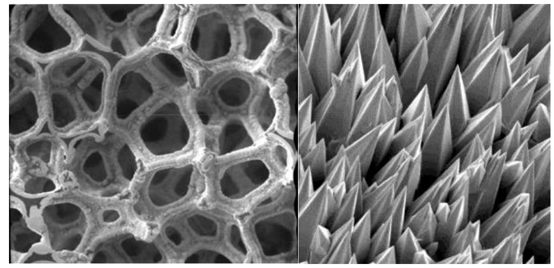
Scientists at Sandia National Laboratories collaborated with AllComp in to test a radiator for use in the space program. Heat generated in the operation of equipment in a spacecraft requires some process to remove the heat and keep the craft from overheating. The component tested build by AllComp and tested at Sandia used heat pipes to spread heat in a carbon composite (C-C Heatpipe Space Radiator) and the panel dissed the heat by radiation into space.


Graphite wheel to chop beam in a Michigan State University accelerator. Inset is color-enhanced photo from an infrared camera during high heat flux tests at Sandia National Laboratories.



The colorized snapshot from an infrared camera shows heating of a graphite wheel that would spin rapidly to ”chop” the beam of an accelerator at the Facility for Rare Isotope Beams (FRIB) at Michigan State University. Scientists at this facility make discoveries about the properties of these rare isotopes in order to better understand the physics of nuclei, nuclear astrophysics, fundamental interactions, and applications for society. In the accelerator, the ion beam would heat the rapidly rotating wheel and a portion would pass through the slots. In tests at Sandia National Laboratories, the heating of the wheel was simulated by rapidly moving the spot of an electron beam in a circular pattern around the outer blade of the graphite wheel. The bright band in the picture is a color-enhanced frame from an infrared camera that shows both the heating of the wheel and the ripple from some deflection.

In collaborative research with two small businesses, scientists at Sandia National Laboratories performed high heat flux testing of two types of innovative components used to transfer heat from one fluid to another. For example, a car radiator is a heat exchanger (HX) that transfers heat from the water that cools the engine to the air the blow through the radiator. The small business Technova developed a method to strengthen the material in their exchanger using nano-wires. In a cooperative research and development agreement or CRADA with Ultramet, Inc, Sandia tested a high temperature heat exchanger in which heat was exchanged between liquid lithium and helium. The Li/He Refractory HX was an application for use in space and among its innovative ideas was a surface of tiny molybdenum needles to enhance heat transfer with the lithium and molybdenum foam through which the helium flowed.



Molybdenum (Mo) foam (left) and tiny Mo needles (right) in a exchanger made by Ultamet using chemical vapor deposition.