Public Abstract
First Name:David
Middle Name:Eugene
Last Name:Meier
Adviser's First Name:John
Adviser's Last Name:Robertson
Co-Adviser's First Name:
Co-Adviser's Last Name:
Graduation Term:FS 2008
Department:Chemistry
Degree:PhD
Title:Radionuclide Production for Radioisotope Micro-Power Source Technologies

Radioisotope micro-power sources (RIMS) hold great promise for the development of miniaturized power sources that are compatible with the advances made in micro-electromechanical (MEMS) system technologies. While a number of nuclear conversion technologies can be employed in RIMS, betavoltaic conversion technologies can be incorporated into the semiconductor manufacturing processes used in MEMS. A solid-state betavoltaic RIMS device consists of a p-n semiconductor coupled with a beta-emitting radionuclide and is analogous to solar cell technology. Liquid semiconductor betavoltaic devices were investigated simultaneously with the solid-state designs as an alternative concept designed to harness the increased energy density available with high-energy charged particles. Radioisotopes used for the fabrication of solid-state semiconductor sources include P-33 and Pm-147. Sulfur-35 was selected as the isotope for liquid semiconductor tests because of advantageous nuclear and chemical properties that are compatible with liquid semiconductor technology. The irradiation, separation and subsequent chemistries of curie amounts of activity were performed at the University of Missouri Research Reactor (MURR) for S-35 and Pm-147. The radioactive material was incorporated into betavoltaic devices and small amounts of power were consistently produced. Although this uninterruptible power supply will not meet upcoming energy demands facing this nation, there is potential for this technology to be incorporated to power certain components present in many different types of consumer, research and military devices.