Paper ID: 36229
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SPACE PROPULSION SYMPOSIUM (C4)
Joint Session on Advanced and Nuclear Power and Propulsion Systems (7-C3.5)

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UPDATE ON 241AM PRODUCTION FOR USE IN RADIOISOTOPE POWER SYSTEMS

Abstract

Plutonium-238 has been used as a power source for spacecraft since the early days of space exploration. It has proven to be an effective source of power where the use of solar generated power is impractical. Historically, Europe has relied on collaborations with the USA or Russia to access these nuclear power sources. During 2009, the European Space Agency (ESA) funded a project to examine the cost and practicality of establishing a European source of material suitable for Radioisotope Power Systems (RPS) and concluded that 241Am was the most suitable choice for European based production. This takes what would otherwise be a waste material from the nuclear industry and uses it to power future science exploration missions in outer space. This is also very much cheaper than the development of a European supply of 238Pu, and the material has much greater availability opening up the potential for many more missions.

The preferred European alternative of 241Am for use in future RPS and the issues that will need to be addressed has continued with the development and underpinning of a conceptual flowsheet to be used for production of 241Am. The National Nuclear Laboratory has assessed the feasibility and costs associated with installing within its existing facilities a European Radioisotope Production Facility to produce 241Am for use by the European Space Agency in radioisotope power systems for space missions. Work has also been completed on validating the flowsheet, along with the production of a quantity of separated 241Am for analysis. This has included using aged plutonium in NNL's PuMA laboratory and the separation of 241Am from this material.

As part of a consortium, the National Nuclear Laboratory has also assessed the feasibility and design required for an Am2O3 fuelled pellet that is consistent with conventional RTG and RHU configurations. With confirmation of the flowsheet performance, and the development of the costed design for a suitable production plant, the next phase of work is focus on the optimization of the process to achieve a particular particle size range / morphology coupled with pellet forming studies.

Provision of RPSs to future mission would bring significant benefit to the range of science in space exploration that is able to be achieved. The paper will outline the reasons behind the choice of 241Am, the development work that has taken place so far, and the expected route forward towards a flight ready system.