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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.

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. The full scale process is planned to be housed within the NNL's Central Laboratory in an existing facility designed for plutonium active operations. The scope of the overall project is "store to store" – the starting point is aged plutonium currently housed in existing Sellafield stores and the end point is the storage of separated plutonium and americium powders on the Sellafield site. The minimum ²⁴¹Am content of the feed will be 3.5

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.