Colorado School of Mines
Office for Technology Transfer

New Reactivity Control System for Small Reactor Unit – Rotating Reflector

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Description: Due to the small reactivity swings associated with space reactors, rotating control drums located in the reflector region containing thin layers of B_4C are the most common reactivity control system used in fission space reactors today. This control system is also based on vast experience derived from terrestrial applications, mainly in test research reactors such as the ATR at Idaho National Laboratory. The main idea behind this configuration is to introduce some perturbation into the reflectors that will have an impact on the neutrons reflected back to the core resulting in changing the system's reactivity. Ideally, there are two main ways of disturbing the reflector efficiency; first by introducing parasitic absorbers into the reflector and second by changing the reflector properties through the introduction of less effective reflector materials. The selection of appropriate reactivity control depends on the type of reactor core (fast, epi-thermal or thermal), and the required excess reactivity that needs to be controlled over the entire core lifetime. In the present paper we are investigating several reactivity control system options, and demonstrating their applicability and effectiveness on a small HTGR unit for space applications. The impact of each control system option on power distribution (peaking factor), and their flexibility to control excess reactivity through the core lifetime is studied. The low density parasitic absorbers material that is considered in this research is B_4C. Partial replacement of an excellent reflector material such as BeO with a less effective one such as void or SiC are also investigated. Although the applications are demonstrated on a small HTGR unit, the applicability can be extended and optimized for different small unit concepts. Finally, a new reactivity control system for space rector is presented.

Potential Areas of Application

- Photovoltaic recycling
- Reapplication of recovered Cadmium Telluride

Main Advantages of this Invention

- Eighty percent yield
- Little to no acid needed
- Solves technical concerns of current system

Intellectual Property Status: Provisional patent filed June 21, 2011

ID number: US Patent application 61/499,293

Opportunity: We are seeking an exclusive or non-exclusive licensee for marketing, manufacturing, and sale of this technology.

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