

Fully Ceramic Matrix Micro-Encapsulated Fuel Form

Disclosure Number

201002402

Technology Summary

This invention provides a concept and route to fabrication of a Fully-Ceramic, silicon carbide (SiC) matrix, Micro-encapsulated nuclear fuel (FCM). The described FCM has moderate thermal conductivity and is repository stable. The SiC matrix processing route is simple and economic. The FCM fuel concept can be used in combination with fissile/fertile microencapsulated fuel kernels or an actinide transmutation fuel kernel. The SiC layer on the fuel kernel is the primary boundary and the SiC matrix is the secondary barrier to fission product (FP) and actinide diffusion and other releases of radioactivity. A third barrier may be added in the form of a clad around the fuel element. Benefits to application of this fuel form for light water reactors are derived from the additional barriers to FP and actinide diffusion, and from the enhanced thermal conductivity and irradiation stability of the compact as compared to uranium oxide. Benefits for gas-cooled reactors are due to the added barriers to diffusion and the improved irradiation resistance of the SiC matrix as compared to the commonly used graphite matrix. As SiC is considered a repository-stable material benefits will be also derived with regards to final fuel disposition.

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