Fabrication routes for Thorium and Uranium^{233} based AHWR fuel

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India's economic growth is on a fast growth track. The growth in population and economy is creating huge demand for energy which has to be met with environmentally benign technologies. Nuclear Energy is best suited to meet this demand without causing undue environmental impact [1]. Considering the large thorium reserves in India, the future nuclear power program will be based on Thorium- Uranium^{233} fuel cycle. The major characteristic of thorium as the fuel of future comes from its superior fuel utilization. U^{233} produced in a reactor is always contaminated with U^{232}. This U^{232} undergoes a decay to produce Th^{228} and it is followed by decay chain including Bi ^{212} and Tl ^{201} [2]. Both Bi ^{212} and Tl^{208} are hard gamma emitters ranging from 0.6 Mev-1.6 MeV and 2.6 MeV respectively, which necessitates its handling in hotcell. The average concentration of U^{232} is expected to exceed 1000 ppm after a burn-up of 24,000MWD/t. Work related to developing the fuel fabrication technology including automation and remotization needed for U^{233} based fuels is in progress. Various process for fuel fabrication have been developed i.e. Coated Agglomerate Pelletisation (CAP), impregnation technique (Pellet/Gel), Sol Gel Micro-sphere Pelletisation (SGMP) apart from Powder to Pellet (POP) route. This paper describes each process with respect to its advantages, disadvantages and its amenability to automation and remotisation.

Keywords: U233, AHWR, CAP, SGMP, Impregnation

Ref:

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