MANAGEMENT OF RESEARCH REACTOR SPENT FUEL IN LATIN AMERICA

[1]Silva, A.T.; [1]Terremoto, L.A.A.; [1]Silva, J.E.R.da; [1]Mattar Neto, M.; [2]Forbicini, M.C.A.L.de O.; [3]Martinelli, J.R.

[1]Centro de Engenharia Nuclear - IPEN/CNEN-SP; [2]Centro de Química e Meio Ambiente - IPEN/CNEN-SP; [3]Centro de Ciência e Tecnologia dos Materiais - IPEN/CNEN-SP

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The objectives of the Regional Project IAEA "Research Reactor Spent Fuel Management Options in Latin America" are to define the basic conditions for a regional strategy for managing spent fuel that will provide solutions that are in the economic and technological realities of the countries involved, and in particular, to determine what is needed for the temporary wet and dry storage of spent fuel from the research reactors in the countries of Latin America region.

The project was organized in four main activities: spent fuel characterization, nuclear safety and regulation, options for spent fuel management and public communication. IPEN is collaborating in the activities related to the spent fuel characterization and options for spent fuel management. The spent fuel characterization activity aims at the implementation of a surveillance program for research reactor spent fuel in interim storage in every participant country, that includes methodologies to perform: water quality control, visual inspection, sipping test, corrosion monitoring by coupon assesment, non destructive burn-up test, etc. Besides, a common database of the region for the use of the participants countries and IAEA was developed.

The Fuel Engineering group of IPEN has participated in 2002/2004 in a comparison study of burnup determination by destructive chemical methods (performed by the Argentinean counterpart) and by neutronic calculations (performed by all the other participants). Good agreement within the experimental error was observed between both results.

The group has also participated in the 2nd Regional Workshop On Characterization of Spent Fuel From Research Reactors in Buenos Aires where was presented the paper "Catalogue of Images for Classifying Spent MTR Fuel Elements Stored in Temporary Storage at IEA-R1 Reactor Pool".

The option for spent fuel management activity deals with the identification of the needs for the research reactor spent fuel management, particularly for the operational and interim storage (wet and dry), spent fuel transportation and spent fuel conditioning. The only research reactor in Brazil that has concerns related to spent fuel interim storage is reactor IEA-R1 at IPEN. These concerns were the driving force to define a strategy for managing spent fuel and to provide solutions taking in consideration the economic and technological realities of the country. As part of this strategy, CDTN and IPEN started the design, testing and licensing of a dual purpose cask for transport and storage of spent MTR and TRIGA type research reactor fuels. Two main topics were developed related the dual purpose cask for transportation and storage of research reactor fuel:

(I) the characterization and use of castor oil polyurethane foam in impact limiters for radioactive materials packages including mechanical laboratory tests, simplified methods for best foam density selection, finite elements numerical simulation of impact tests and experimental impact tests;
(ii) Conceptual studies of dual purpose casks for storage and transportation of plate type (MTR) and rods (TRIGA) research reactors spent fuel. Conditioning processes for the Brazilian research reactors will consider Al+Al-U alloys.

The actions taken up to now involve two active research lines:
1) Dissolution of the whole fuel plate through a wet process by a eletrochemical separation of aluminum from irradiated uranium silicide fuels. The remaining uranium silicide compound (after the isotopic dilution) could be immobilised.
2) Immobilisation of the waste in a suitable matrix (glass). Technologies considered: glass sintering and glass melting. For the vitrification process, niobium-phosphate glasses are being considered. The technologies are: conventional sintering and melting either in microwave oven or in eletrical furnace.