

3rd International Conference on **Nuclear and Plasma Physics**
&
4th International Conference on **Quantum Physics and Quantum Technology**
November 05-06, 2018 | London, UK



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Innovative radioactive graphite waste management in fission and fusion material decommissioning

A special graphite digestion method has been developed for the digestion of about 180 metric tons of irradiated graphite fuel from the German HTGR reactors. The irradiated fuel consists of about 900000 graphite pebbles. Each pebble contains 200 g A3- or A27-graphite mixed with up to 11 g uranium-thorium fuel incorporated in coated particles of different compositions. Additionally, gaseous fission products and C-14 are contained in the fuel or graphite, respectively. Existing digestion methods, mainly based on mechanical milling, are considered to be unsuitable for such a high excess of graphite over irradiated fuel, and the need to recuperate radioactive gaseous products. With the new method, it is foreseen to digest about 0.2 metric tons of graphite per day. Uranium will be recovered and downblended, and the gaseous products will be collected. It is proposed to use a similar method for the digestion of other radioactive graphite material. An example could be graphite tiles from fusion experiments and later from fusion power plants. Even if the graphite, e.g. in the form of CFCs (chlorofluorocarbons), is mounted directly on a holder, the digestion method will allow the segregation of the graphite from metallic components. It should be noted that the method has not been tested on fusion material yet. This paper will present an innovative digestion and recuperation method which has been developed for graphite fuel from high temperature graphite reactors (HTGR) and might be adapted for the needs of fusion materials as well.

Biography

Guenter Mank is the Head of the Executive Office the Jülicher Entsorgungsgesellschaft für Nuklearanlagen with responsibilities for the decommissioning of nuclear research reactors. Previously, he was leading the Physics Section at the International Atomic Energy Agency (IAEA) in Vienna, Austria and was a Research Associate of international fusion experiments. He has published more than 90 refereed papers on fusion, atomic and nuclear physics in scientific journals and contributed to more than 200 presentations and papers at international conferences. He received his PhD in Atomic Physics and a Diploma in Nuclear Physics from the Justus-Liebig-University in Giessen, Germany.

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