

The Characterisation of Nuclear Graphites in UK Reactors Scheduled for Decommissioning.



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UK Graphite Background

Radioactive graphite dismantling and the management of radioactive graphite waste is an important issue for a UK nuclear future.



There are 38 major graphite moderated power, production and research reactors in the United Kingdom (18 of which are still operational).

When all of these reactors closed they will produce approximately **90,000** tons of irradiated nuclear graphite.

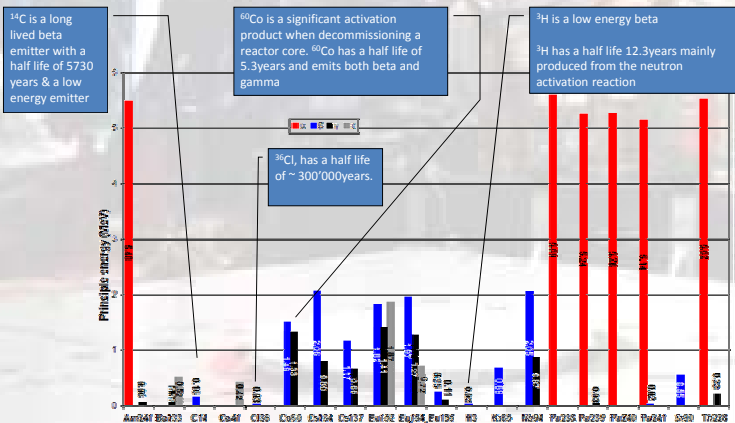
Graphite is not involved in the nuclear fuel reaction, it is subjected to the activation products as a result of nuclear fusion reactions.



Photographs of a AGR graphite reactor core and moderator graphite bricks.

Radioisotope Inventory

Radioisotopes of concern include: ^3H , ^{14}C , ^{36}Cl , ^{41}Ca , ^{55}Fe , ^{60}Co , ^{63}Ni , ^{90}Sr , ^{133}Ba , ^{137}Cs , ^{152}Eu , ^{154}Eu and some transuranics.

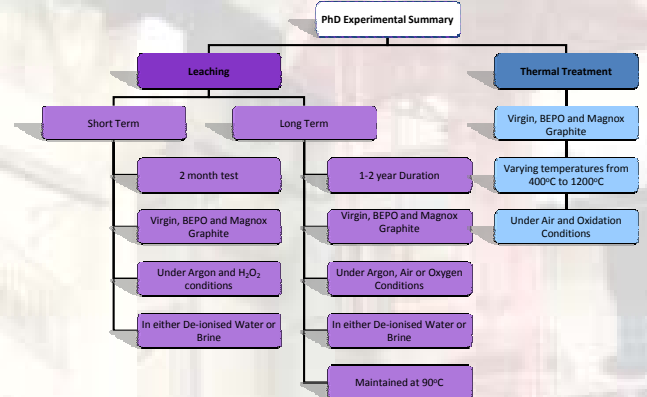


The isotopes of significance depend on quantity, half life and free neutron kinetic energy.

Removal of isotopic contamination would reduce nuclear graphite waste from ILW to VLLW will significantly decrease the costs of decommissioning and improve safety and public perceptions.

Research Objectives

The aims of this project are to obtain a better understanding of type and location of impurities in un-irradiated graphite and to relate that understanding to the behaviour of impurities (e.g. isotope formation) in irradiated graphite.



Research Program

Characterisation of irradiated graphite waste

Graphite Structure, Isotopic content, location and retention.

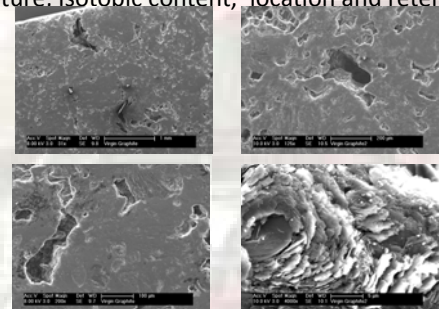


Figure 1. SEM images of virgin BEPO graphite.

Treatment of irradiated graphite waste

^{14}C and ^3H isotopic immobilization will be carried out using thermal treatment and leaching tests to determine isotopic leaching rates, isotopic location and retention. The residual isotopic content will be quantified using Liquid Scintillation counting.

This work may lead to a further understanding of the isotopic location within UK nuclear graphite and may assist in an understanding of isotopic migration mechanisms.



Photograph of Carbolite furnaces

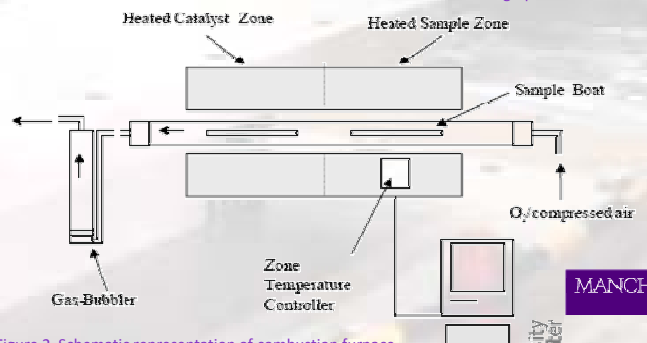


Figure 2. Schematic representation of combustion furnace.