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## Impurities characterization to support decommissioning and management of irradiated graphite waste

Nuclear graphite has been widely used as moderator and reflector in I and II generation reactors and it is being considered for some next generation projects. Several graphite-moderated nuclear reactors have already been permanently shut-down, and others will be in the next years. Therefore, decommissioning of this material is becoming an important issue, given that an ultimate strategy for treatment and disposal has not been found, yet. In fact, the very large use of nuclear graphite is often accompanied by some knowledge gaps, such as activation of impurities in the irradiated material. Experiments reported in the paper aim at obtaining a complete characterization of virgin graphite: an accurate elemental composition of the non-irradiated material is a vital input data for those neutron activation models that are commonly used to estimate radionuclides inventory and to support the radiological characterization before dismantling operations. Inductively coupled plasma mass spectrometry (ICP-MS) analysis can be implemented to quantitatively assess the presence of large numbers of analytes, with high sensitivity. On the other hand, neutron-activation based techniques, as prompt gamma neutron activation analysis (PGAA), can be effectively applied to measure those lighter elements for which mass spectrometer would be ineffective. The proposed experiment considers samples obtained from a virgin graphite rod. ICP-MS results revealed to be mostly consistent with literature history on different types of nuclear-grade graphite, while PGAA confirmed with a good margin the bulk concentrations for most of the nuclides obtained by ICP-MS analysis, and allowed evaluations on the lighter ones. Future works on nuclear graphite could involve analysis on activated samples, in order to compare and validate the already obtained characterization on virgin graphite.

### Do you wish to participate as a Young Professional?

No

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Not specified

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