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Isotopic characterization by Q-ICP-MS of some α emitters in Cuban soil

The determination of alpha emitters, namely uranium, thorium and plutonium isotopes, in the soils, is a useful way to evaluate the radioactive fallout and to better understand the isotopic distribution profiles in different soil layers.

Due to the particular geographic position and the economical and political condition, Cuba could be considered as a unique "natural habitat" in the boreal hemisphere. The total lack of human activities having as a main consequence or as a side effect the production of artificial radionuclides, with the only exception of the temporary installation of strategic missiles and the patrolling of the territorial water by some nuclear ships, makes the island territory free from any radiological human contamination. As the Cuba Island has never been contaminated by artificial human activities employing alpha emitters, these soils could be specifically considered as a reference soil samples for the Central American zone, for the determination of the radiological contamination due to a fall-out consequent to performing air experiments, testing weapons or nuclear power plants accidents.

It is well known that the analytical results, especially for the determination of some actinides, are strongly influenced by some characteristics of the samples. Inhomogeneity, broad distribution of the particles and very low concentration effects were considered. For these reasons, a monitoring campaign regarding the determination of amount of radionuclides such as thorium, uranium, radium and plutonium in different environmental matrices is very interesting. However the most commonly used analytical methods (alpha-spectrometry, neutron activation analysis) are too laborious, too expensive and time consuming to enable an accurate characterization of the territory and a constant monitoring of the radioactive levels in the environment. To overcome these disadvantages, a new analytical approach was used to develop a rapid, simple and reasonably cheap method, which can be exported towards other environmental laboratories.

This method was tested by comparing the results obtained in different laboratories using ICP-MS and different nuclear measurement techniques, such as gamma and alpha spectrometry.

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