Presentation

PRESENTATION OF THE RESEARCH WORK OF THE CADI AYYAD UNIVERSITY, MARRAKECH

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We developed three new and original methods based on the formalism of energy loss of alpha-particles inside different media for evaluating the ^{238}U and ^{232}Th concentrations, at trace levels (10^{-6}g/g), inside different material samples: rocks, soils, water, foodstuffs, plants, phosphates, tobacco, medical drugs….

The first method is based on evaluating first the probabilities for alpha-particles emitted by the ^{238}U (8 alpha-particles) and ^{232}Th (7 alpha-particles) natural radioactive series inside a material sample to reach and be registered as bright holes on the LR-115 type II and CR-39 solid state nuclear track detectors, and secondly on measuring the alpha-particles track density rates registered on the detectors utilized. The second method consists of evaluating the mean critical angles of etching of the LR-115 type II and CR-39 solid state nuclear track detectors and measuring the resulting track density rates due to alpha-particles emitted by the ^{238}U and ^{232}Th radioactive families. The third new method is based on calculating the detection efficiencies of the LR-115 type II and CR-39 solid state nuclear track detectors for alpha-particles emitted by the nuclei of the ^{238}U and ^{232}Th radioactive series, by using a new Monte Carlo computer programme, and measuring the resulting track density rates registered on the considered detectors. This new method is described in detail in our paper. Compared to the other existing techniques, our three new nuclear methods have the advantages of being accurate (the relative uncertainty is lower than 8%), inexpensive, non-destructive, sensitive, and do not need the use of standards for their calibration.

We developed two new and original nuclear methods for measuring the concentrations of radon, thoron and their decay products inside various atmospheres: air of dwellings, cigarette smoke, air of work places and soil gas. We also developed two new theoretical and experimental methods for measuring radon and thoron concentrations inside and outside various natural material samples: soils, rocks, water, phosphates and medicinal plants.

We developed a new dosimetric model based on determining alpha- specific doses deposited by an activity of 1Bq of ^{238}U and an activity of 1Bq of ^{232}Th in different human organs and tissues and exploiting results obtained for the ^{238}U and ^{232}Th measured inside the ingested waters and foodstuffs for evaluating the committed equivalent doses as well effective doses due to ^{238}U and ^{232}Th in the human body from the ingestion of different foodstuffs and drinking drinks. We developed a new dosimetric model based on evaluating the alpha specific doses deposited by 1Bq of ^{218}Po and 1Bq of ^{214}Po in the tissues of the

human respiratory tract and measuring the concentrations of these radionuclides inside the air of various dwellings and work places for determining the committed equivalent doses and effective doses due to ^{218}Po and ^{214}Po after the inhalation of polluted and unpolluted air.

We developed a new dosimetric model for evaluating the committed equivalent dose due to radon in different compartments of the human gastrointestinal system from the ingestion of drinking waters and medical drug preparations.

We developed a new dosimetric model for determining effective doses due to ^{238}U, ^{232}Th and ^{222}Rn from to the skin from the application of various black soap, plant oil and thermal water material samples by the members of the general public.