evaluated. Tests cases had been developed according to the Brazilian reality, having as reference the radiotherapy treatments carried out in the National Institute of the Cancer. The system developed for checking the quality of treatment planning systems with electrons was efficient in evaluating the Eclipse planning system by identifying the failures of their algorithms, especially in planning the isodose. The verification system has been validated against the Monte Carlo method and the experimental data with an ionization chamber and showed the shortcomings of generalized pencil beam and eMC algorithms.

Using the Monte Carlo Library Least Squares (MCLLS) Approach for the PGNAA Measurement of Chromium in Aqueous Solution

Yan Zhang [1,2,3], WenBao Jia [1, 3], Robin Gardner [2], Qing Shan [1, 3], Daqian Hei [1, 3]
[1] College of Materials Science and Engineering, Nanjing University of Aeronautics and Astronautics, Nanjing 210016, China.
[2] Center for Engineering Application of Radioisotopes (CEAR), Department of Nuclear Engineering, North Carolina State University, Raleigh, NC 27695, USA.
[3] Collaborative Innovation Center of Radiation Medicine of Jiangsu Higher Education Institutions, Suzhou 215000, China

Presenter: Yan Zhang
[1] College of Materials Science and Engineering, Nanjing University of Aeronautics and Astronautics, Nanjing 210016, China.
[2] Center for Engineering Application of Radioisotopes (CEAR), Department of Nuclear Engineering, North Carolina State Univ, 296295220@qq.com

A prompt gamma neutron activation analysis (PGNAA) setup, with a 300 mCi 241Am-Be neutron source and a 4×4 inch BGO detector, was developed for chromium detection in aqueous solutions. In the present work, a series of standard samples were prepared by dissolving lead compounds in deionized water. Quantitative spectrum analysis was done by using Monte Carlo-Least-Squares (MCLLS) approach to measure the standard samples. The simulates of element libraries were in-silico by utilizing a CEARCPG code, developed in the Center for Engineering Application of Radioisotopes (CEAR) of North Carolina State University. Simulation results were presented that are in good agreement with experimental results. The correlation coefficients were very close to 1 by comparing the fitted spectrum with the experiment spectrum. By applying the MCLLS approach, relative deviation (%D) of the chromium measurement accuracy was less than 4.09%.

Improvement of Sievert Integration Model in Brachytherapy via Inverse Problems and Artificial Neural Networks

1. Eriberto O. Nascimento, Instituto Federal de Educação, Ciência e Tecnologia (IFG), Goiânia, GO, Brazil;
2. Lucas N. Oliveira, Instituto Federal de Educação, Ciência e Tecnologia (IFG), Goiânia, GO, Brazil;
3. Linda V.E. Caldas, Instituto de Pesquisas Energéticas e Nucleares, Comissão Nacional de Energia Nuclear (IPEN/CNEN), São Paulo, SP, Brazil.

Presenter: Linda V. E. Caldas
Instituto de Pesquisas Energéticas e Nucleares, Comissão Nacional de Energia Nuclear (IPEN/CNEN), São Paulo, SP, Brazil, lcaldas@ipen.br

Increasing the radial distance, the accuracy of the Sievert Integration Model (SIM) decreases in a non-linear manner, adding errors up of 10% into the dose rate calculations; a similar fact occurs to the 2D anisotropy function where the errors may achieve 30% as already related. For that reason, this paper sought an innovative approach to optimize the error variance and its biases of dose rate calculations around a Nucletron brachytherapy source of 192Ir from 0 to 10 cm taken in the radial distance, using an improved SIM through a hybrid coupling of Artificial Neural Networks (ANN) and Inverse Problem Theory (IPT). Since the traditional approach relies into the use of a small data set of dose rate, the ANN generalized these doses, making possible to search more broadly optimum parameters to SIM using the IPT. The results showed excellent accuracy evaluated with the Root Mean Square Percentage Error (RMSPE). In conclusion, the low RMSPE values indicate that the methodology is a consistent methodology, showing an excellent agreement with the state of art of dosimetric measurement techniques.

Determination of Si content in Fe-doped HfSiO4 nanoparticles by neutron activation analysis

T. S. N. Sales[1], B. Bosch-Santos[1], M. Saiki1, L. F. Pereira[1] , A. W. Carbonari[1], R. N. Saxena[1]. A. Burimova[1,2].
[1]Nuclear and Energy Research Institute (IPEN-CNEN/SP) University of São Paulo, São Paulo, SP, Brazil.
[2]Federal University of ABC, Santo André, SP, Brazil.

Presenter: T. S. N. Sales, Nuclear and Energy Research Institute (IPEN-CNEN/SP) University of São Paulo, São Paulo, SP, Brazil., tatianenas@usp.br

New synthesis method of Fe-doped hafnium silicate nanoparticles (NPs) with tetragonal structure is reported. The procedure implies auto-controlled incorporation of Si from the quartz to the iron-doped hafnium oxide NPs. X-ray diffraction data has shown that lattice parameters of Fe-HfSiO4 thus obtained are very close to those previously known for hafnon. It was established that the hafnon-like phase has stabilized at T=1173K which is ~500K lower than the corresponding transition of bare bulk hafnium silicate. The