investigations of the inorganic elements in saliva have increased as a way of diagnosing. The major advantage for using saliva in diagnosis is the easy access and collection (non-invasive). Saliva is consists mainly of water in addition to electrolytes and enzymes. It performs several functions in the oral mucosa: keeps the acidity of the mouth, prevents dental caries, participates in the digestion process and helps in the water balance maintenance (body fluids excretion). Several minor and major glands contributing to the saliva formation, such as: parotid, submandibular and sublingual and other smaller glands. The whole saliva is the mixture of these glandular secretions and other components such as bacteria and epithelias cells. In this study we investigated the whole non-stimulated saliva of 26 healthy subjects (mean age 33.9 years, range: 26 to 49 years) and 11 patients with periodontal disease (mean age 41.7 years; range 29 to 55 years) using Neutron Activation Analysis (NAA) technique. The samples were obtained from donors at São Paulo city (Brazil). Saliva samples were collected in a dental office at the same time of the day, near lunch time, between 10:00AM to 12:00PM (with an interval of two hours fasting, at least), spontaneously (without stimulation) directly in sterilized plastic containers. The analyses were performed in the nuclear reactor IEA-R1 (3.5-4.5MW, pool type) at IPEN/CNEN-SP (Brazil). We found considerable changes, mainly in Ca and S salivas level.

[03/09/12 - P032]
Partially Connected Neural Network Implemented in GPU Cores for CT Reconstruction, Hamilton P. da Silva, Ivan Evseev, *UTFPR - Medianeira*, Ricardo T. Lopes, *UFRJ*, Luciano F. de Medeiros, *UNINTER* ■ The CT Reconstruction under a parallel paradigm can be implemented by means of an algorithm that uses an isomorphism of neural networks concepts, the Partially Connected Neural Network (PCNN), capable to extract the mapping of the final reconstructed image related to the sinogram set, without the common math used in algorithms like Filtered Backprojection (FBP). This mapping calculated previously connects the points of the projections (s, θ) with each pixel of final image through of an array that stores the respective sinogram sums needed for each final (x,y) point. The space complexity of this mapping is $O(MN^2)$, M projections and N points of the sinogram and final image respectively, provided by an input array built in the host code. From this step, the algorithm implemented inside the GTX560TI GPU runs each part of the entire sum, coded as a kernel and distributed in parallel cores, only using the shared memory references and the sum operation. Early simulations with PCNN using Core i7, with CT images of Shepp-Logan phantom 100x60, achieve a performance 20 times better than the classic FBP algorithm. However, the PCNN algorithm implemented in GPU spent more time than the reconstruction under FBP by a factor of 10, showing that the load and store memory operations have more cost than the native math operations in GPU. The authors will use in future implementations the GPU texture memory for comparison of the performances, which technique can bring more speed for the memory operations in GPU.

[03/09/12 - P033]
Sulfur determination from inhabitants of Brasil using Neutron Activation Analysis, L.C. OLIVEIRA, C.B. ZAMBONI, *IPEN - USP - SP* ■ There are hundreds of sulfur-containing compounds in the human body and the body synthesizes most of them. The sulfur in body participates in the repair and construction of tissues and cells and the formation of several vitamins and proteins. The major source of inorganic sulfate for humans is from biodegradation due to body protein turnover of the sulfur amino acids (such as, methionine and cysteine); the remainder is supplied from sulfate in water and foods. In Brasil, elemental-S is used as a fertilizer in tropical soils while the application of sulfur dioxide is applied in dried fruits for keeping the color and to protect the flavor from oxidation. Sulfate salts are also used as growth-promoting feed additives for farm animals (chickens, turkeys and pigs) highly consumed by Brazilian population. Gastrointestinal absorption of sulfate can occur in the stomach, small intestine, and colon. When soluble sulfate salts (mainly, potassium sulfate or sodium sulfate) are consumed, more than 80Despite these findings, sulfur requirements intakes (recommended levels) or an adequate intake is not established. In this study the NAA technique was applied to analyze S in blood from inhabitants of Brasil for the proposition of an indicative interval. The measures were performed considering lifestyle factors (non-smokers, non-drinkers and no history of toxicological exposure) of Brazilian inhabitants. A healthy group constituted by male and female blood donors ages between 18 and 70 years and above 50 kg, were selected of the blood banks of Brasil. The blood samples were irradiated for 4 minutes in a pneumatic station in the nuclear reactor (IEA-R1, 2-4MW, pool type) at IPEN. The results were compared considering geographical location, gender and age. These indicative intervals can be useful to identify or prevent diseases caused by inadequate sulfur ingestion.

[03/09/12 - P034]
Gamma-Spectrometry and Mineralogy in Guarapari (ES) Beach Sands, Vitor A.P. Aguiar, Nilberto H. Medina, *Instituto de Física da Universidade de São Paulo*, Daniel R. Nascimento Jr, *Universidade Federal do Ceará, Instituto de Geociências da Universidade de São Paulo*, Paulo C.F. Giannini, *Instituto de Geociências da Universidade de São Paulo* ■ We have searched for a correlation between the mineralogy of Guarapari (ES) beach sands and the most common natural radioactive isotopes (^{40}K, ^{238}U and ^{232}Th) content, which are responsible for the elevated dose rates measured in the region, using gamma-ray spectrometry [1]. Two samples were collect and analyzed from seven different beaches in this region, one from the Northern and another one from the Southern part of each beach. The samples were submitted to granulometric and densimetric analysis, followed by an optical microscopy, in order to identify the mineral assembly of each sample. Because of inherent difficulties of optical microscopy, this analysis was performed only in the fine granulometric fractions. The samples were placed inside a 15 cm lead shield,

in order to reduce background radiation and intensify peak/background ratio for the gamma-ray peaks of interest, i.e., those from the isotopes of the ^{232}Th and ^{238}U decay series and the gamma-ray peak emitted in the decay of ^{40}K [2]. Radionuclide distribution were obtained for the geographic location and also for the mineral content of each beach. No correlation between location and radioactive content was observed. The only beaches that stood out were Praia do Diabo, which showed a ^{40}K content up to 1.60(4) ppm and Praia da Areia Preta, with a quantity of thorium up to 81.8(19) ppm. In Praia da Areia Preta, the high quantity of thorium can be correlated with the elevated presence of monazite, a thorium-rich phosphate of rare earth metals. It was also observed a growth tendency of uranium and thorium contents with the increase of zircon concentration, a mineral known for its trace contents of such elements, used in geological dating. A better correlation between radioisotopes and mineral species was not possible since many assumptions were done, such as the equality of the mineral assembly in all the granulometric fractions.

References:
[1] R.M. Anjos et al, 2006. Marine Geology 229, 29-43
[2] V.A.P. Aguiar et al, 2010. AIP Conference Proceedings 1245, 98-103.

[03/09/12 - P035]

Assessment of the additions in high density concrete to applications in radiological protection, Avacir Casanova Andrello, Sérgio M de Albuquerque, Carlos Roberto Appoloni, *Universidade Estadual de Londrina, Depto de Física, LFNA* ■

The present work has the objective to assess the influence that the utilization of additions in concrete, such as micro-silica, metacaulin and filler calcareous has on the linear attenuation coefficients of high density concrete by gamma ray transmition and too analyze their porous structure and aggregated distribution by X-ray microtomography technique. To assess the influence that each addition has on composition of linear attenuation coefficient of high density concrete, three samples of concrete was ensaied utilizing a matrix composed by cement, fine sand and magnetite varying the concentration of the addition materials (filler, metacaulin and micro-silica). For a good understanding of the preparation processes of concrete a physical and chemical characterization of the cement, fine sand, magnetite and addition materials were realized. The prove bodies were prepared in a vibratory table where the vibration energy was controlled during the prove bodies preparation. The cure of prove bodies were controlled too by a homogeneous dried. The acquisition of linear attenuation coefficient data was utilized a automatized micro-metric table xy, with a 2 mm collimated beam of Cesium-137 source with activity of 1Ci . A Skyscan 1172 microCT were utilized to obtain microtomographic images. The results obtained show that no has significant variation on linear attenuation coefficients to different addition materials same in different concentrations. The microtomographic images show great homogeneity of the prove bodies.

[03/09/12 - P036]

Multi-scale analysis in carbonates by X-ray microtomography: characterization of the porosity and pore size distribution, Jaquiel S. Fernandes, *Instituto Federal de Educação, Ciência e Tecnologia Catarinense - Câmpus Videira, Brazil*, Rodrigo Nagata, Carlos R. Appoloni, *Laboratório de Física Nuclear Aplicada - Universidade Estadual de Londrina, Brazil*, Anderson C. Moreira, Celso P. Fernandes, *Laboratório de Meios Porosos e Propriedades Termofísicas, Departamento de Engenharia Mecânica - Universidade Federal de Santa Catarina, Florianópolis, Brazil* ■

The porous systems of reservoir rocks present a complex geometry, involving aspects of shape of pores (morphology) and connectivity between the pores (topology). The macroscopic physical properties of these materials are strongly dependent of their microstructures. Based on these aspects, the present study has as main objective the characterization of the porous system geometry and computational determination of petrophysics properties of carbonate reservoir rocks through the X-ray microtomography methodology. Samples were microtomographed with the microtomographs Skyscan model 1172, installed at the PETROBRAS Research and Development Center (CENPES), Rio de Janeiro-RJ, Brazil and model 1173, installed at Sedimentary Geology Laboratory (LAGESD) in the Federal University of Rio de Janeiro (UFRJ). Two samples of carbonates were measured, Travertine and Dolomite, with spatial resolutions of 7 μm and 9.8 μm and 1.3 μm, 7 μm and 17 μm, respectively for the travertine and dolomite. With the data collected in the acquisitions, 900 transversal sections were reconstructed for each one of the referred resolutions. For the sample of dolomite, the average porosity found was 21.64 %, 20.92 % and 15.97 % for resolutions of 1.3 μm, 7 μm and 17 μm, respectively. For the sample of travertine, the average porosity was 7.80 % and 7.52 % for resolutions of 7 μm and 9.8 μm, respectively. For the sample of dolomite, the pore size distribution showed that 50 % of the porous phase has pores with radius up to 37.6 μm, 84.6 μm and 84.4 μm, for the spatial resolutions of 1.3 μm, 7 μm and 17 μm, respectively. For the sample of travertine, 50 % of the pores have radius up to 148.1 μm and 158.1 μm, for the spatial resolutions of 7 μm and 9.8 μm, respectively.

[03/09/12 - P037]

ARCHAEOMETRIC STUDIES BY NEUTRON AND X-RAY RADIOGRAPHY, Rose M. Latini, , Alfredo V. B. Bellido, *Instituto de Química - Universidade Federal Fluminense*, Ubirajara M. Vinagre Filho, Maria I. S. SOUZA, *Instituto de Engenharia Nuclear-IEN /CNEN*, Davi F. Oliveira, Ricardo T. Lopes, *Laboratório de Instrumentação Nuclear - COPPE/UFRJ* ■

Studies of characterization and classification of pottery fragments based on trace chemical elements composition provide important information about the geographical origin [1,2]. The potentialities of instrumental neutron activation analysis (INAA) and Mössbauer Spectroscopy of pottery combined with