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Neutron Activation Analysis applied in sediment samples from the Guarapiranga Reservoir for metals and trace elements assessment

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The Guarapiranga Reservoir is a very important aquatic system due to the fact that it is one of the main water reservoirs for South America's largest city, São Paulo. Guarapiranga basin is located within the Metropolitan Region of São Paulo and the reservoir itself is located in the Northern part of the basin occupying approximately 26 km^2. This reservoir is characterized by environmental impacts from urban invasion, industrial and sewage wastes, all of which seriously affect its water quality and, consequently, the sediment quality. The Environmental Control Agency of the São Paulo State (CETESB) regularly monitors the contamination levels of waters and once a year sediment samples. The aim of this study was to assess the levels of sediment contamination by metals and other trace elements in five sampling points of the reservoir. Two collection campaigns were undertaken: April 2009 and June 2010. The samples were analyzed by Instrumental Neutron Activation Analysis (INAA) in order to determine the following elements: major (Fe, K and Na), trace (As, Ba, Br, Co, Cr, Cs, Hf, Rb, Sb , Sc, Ta, Tb, Th, U and Zn) and rare earths (Ce, Eu, La, Lu, Nd, Sm, Tb and Yb). Comparatively, some elements showed marked decreases in concentration such as As, Rb, Sm, Th and Zn from the first to the second campaign. Some concentration values were compared to NASC (North American Shale Composite). A strong anthropogenic influence was observed for the elements Ce, Eu and La at points SG1; Hf and Lu at points SG2; Br and Cr at points SG4 and SG5; and Th and Zn at points SG3 and SG4.

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Development of an External Neutron Beam Facility at The Ohio State University

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A thermal neutron beam facility to expand the research and educational capacity at The Ohio State University Research Reactor (OSURR) has been constructed. Central to this facility is a neutron collimator designed to deliver, filter and shape a small-sized external neutron beam for characterizing advanced materials and testing radiation detectors. The major parts of the collimator include a piece of graphite closest to the core to soften the neutron spectrum, a single block poly-crystalline bismuth as a gamma filter, a multi-piece single-crystal sapphire as a fast neutron filter and a ^{6}Li glass doped with Cerium for dual purposes: first, as a neutron aperture and secondly as a neutron flux monitor. The beam shutter and beam stop are comprised of borated aluminum, lithiated epoxy, borated polyethylene and lead to shield fast neutrons and high-energy gamma rays. The design has been optimized by MCNP simulation and the flux at detector position is expected at the order of 1×10^7 neutron/cm^2-s. The neutron beam will be tested and characterized with neutron activation analysis and an imaging box that utilizes a scintillation screen, a CCD camera to see the beam profile and a photon counter to correlate neutron flux. A variety of the applications are enabled by this facility such as neutron depth profiling for Li-ion battery study and nuclear materials study, high-resolution neutron imaging for non-destructive evaluation and semiconductor neutron detector testing.