in spas, the present work was developed in Centro de Radiometria Ambiental – IPEN, with the aid of those responsible for the spas of Lambari and Águas de Contendas and, with the objective to perform an inorganic chemical characterization of the mineral waters of Parque das Águas of Lambari and Águas de Contendas. Samples of mineral waters were analyzed in duplicates and concentrated from 500 mL. The samples were irradiated at the IPEN Research Reactor IEA-R1, for a period of 6h under a thermal neutron flux of 10^{12} n $cm^{-2}s^{-1}$. In the samples of mineral waters of the Parque das Águas of Águas de Contendas the elements Ca, Co, Fe, Hf, K, Na, Rb, Sb, Sc, Th, Zn, La and Sm were found. Similarly, in the Parque das Águas of Lambari the elements Ca, Co, Fe, K, Na, Rb, Sb, Sc, Zn, La and Sm were found. The analysis of the samples of these water parks evidenced that the elements of greatest occurrence were La and Co.

P25 PREPARATION OF BIOLOGICAL REFERENCE MATERIALS AT LAN – IPEN – CNEN/SP

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Three biological reference materials were prepared to be used in interlaboratory programs and/or proficiency tests, as well as, for calibration of analytical instruments and validation of analytical methods for environmental trace elements: A Perna perna mussel reference material was produced and certified by means of an interlaboratory comparison. The material was designed as a quality assurance tool for element biomonitoring studies along the Brazilian seashore. For the preparation of the Brazilian mussel reference material, 164kg of Perna perna (Linnaeus, 1758) mussels were purchased from a single producer, from Cocanha Beach in Caraguatatuba City, São Paulo State North Shore where mussels are cultivated by the longline system. After cleaning, freeze-drying and homogenization, the mussel samples were packed in 171 bottles and, the material was irradiated with a gamma ray dose of 5 kGy to enhance its stability. The certified mass fraction values and associated expanded uncertainties were obtained for Al, As, Ca, Cd, Cl, Co, Cu, Fe, K, Mg, Mn, Na, Ni, Se, Th and Zn at the certification campaign. A fish tissue reference material was produced in the context of an International Atomic Energy Agency (IAEA) project aiming analytical quality improvement for laboratories of the Latin American and Caribbean region. Whitemouth croake (Micropogonias furnieri), known as corvina, was the chosen species due to its low cost and high consumption in Latin America countries. For preparation, about 300kg of fish was collected and only the edible parts were used. After adequate processing, the fish material was bottled in 534 bottles with approximately 25g each. The reference values and associated expanded uncertainty (k = 2) were established for As, Cd, Cu, Fe, K, Mn, Na, Se and Zn; Finally, a bovine kidney reference material to be used in the quality control of meat products was prepared using 35 kg of fresh bovine kidney from cattle reared under controlled feeding conditions. The preparation resulted in a final batch of 175 flasks.

It was possible to assign values to 20 elements with their respective uncertainties, being 9 certified values (As, Cu, Fe, K, Mg, Mn, Na, Se and Zn), 10 indicative values (Br, Ca, Cd, Cl, Co, Cs, Hf, Mo, P and Rb) and 1 as additional information (Hg). All the three reference material production projects took advantage of the unique metrological properties of Instrumental Activation Analysis (INAA) not only in the certification process but also in the homogeneity and stability assessment following ISO Guide 30 series recommendations.

AIR POLLUTION ASSESSMENT USING TREE BARKS AS BIOMONITORS P27

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Tree barks are considered to be a promising indicator of air pollution monitoring, because of its accumulation of aerosol particles, simplicity of arboreal species identification and its wide geographical distribution. In this study, barks from Sibipiruna (Caesalpinia peltophoroides) and Tipuana (Tipuana tipu) tree species were collected in different sites in the Metropolitan Region of São Paulo (MRSP) and from two small cities considered as control sites located far from MRSP. The bark samples collected were cleaned and ground for the element analyses. Neutron activation analysis (NAA) was applied for the determination of As, Br, Ca, Cd, Cl, Co, Cr, Cs, Fe, K, La, Mg, Mn, Ni, Rb, Sb, Sc, V and Zn and graphite furnace atomic absorption spectrometry (GF AAS) for Cd, Cu and Pb determinations. Results obtained for samples collected in different sampling sites in the MRSP presented wide variability due to the different pollutants levels that each tree was exposed to. In general, barks from trees located close to high vehicular traffic presented high As, Cd, Pb, Sb and Zn concentrations. The principal components analysis (PCA) was applied to identify sources associated with tree bark element concentrations and according to PCA, 80.97% of the results variance could be explained by four components. The possible origins of these elements were soil resuspension plus vehicular emission, industry, marine aerosols and the tree bark structure itself. The calculated enrichment factors indicated that all the elements originated from anthropic sources, with the exception of Cs. In addition, the enrichment of the elements in tree barks was higher in the MRSP than that from enrichment of barks collected from control sampling sites, indicating that the different levels of vehicular traffic may influence the enrichment of the elements. Despite the different pollution levels, the PCA indicated that there are no significant differences between MRSP and control sites with regards to emission characteristics, probably due to the control sites being located in urban areas. The analytical control of the results was checked by analyzing certified reference materials and the results indicated that NAA and GF AAS provided reliable data for element concentrations with standardized differences, $|Z\ \text{score}| < 2$.

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