LICHEN SPECIES ANALYSES FOR ATMOSPHERIC POLLUTION BIOMONITORING IN THE SANTO ANDRÉ MUNICIPALITY, SÃO PAULO, BRAZIL

M. SAIKI[1], E. R. ALVES[1], M. P. MARCELLI[2]

[1]Instituto de Pesquisas Energéticas e Nucleares, IPEN-CNEN/SP, Neutron Activation Analysis Laboratory, Av. Prof. Lineu Prestes 2242, CEP 05508-000, São Paulo, SP, Brazil

[2]Instituto de Botânica, Avenida Miguel Stefano, CEP 01061-970, São Paulo, SP, Brazil

e-mail: mitiko@curiango.ipen.br

The use of lichens as atmospheric pollution biomonitor presents several advantages since their sample collections are not expensive and can be used at several numbers of sites so that a comparative data can be achieved. Moreover, lichens are perennial and can accumulate elements originating from natural and anthropogenic sources over long periods of time and their high degree of trace element accumulation enables the determination of several elements with high precision and accuracy.

The aim of this study was to evaluate levels of trace element pollutants in the Santo André Municipality by analyzing lichen species. Santo André is part of the São Paulo Metropolitan Area, with a population of 625,000 and total area of 174.4 km^2. This municipality has a serious environmental pollution problem from industrial and vehicular origins.

Canoparmelia texana epiphytic lichen species was chosen in this study and the samples were collected in different sites of the Santo André Municipality and sites of unpolluted area of the Atlantic Forest. The lichen samples were collected from the bark of trees using a titanium knife and for analyses they were cleaned, freeze-dried and ground to obtain a fine powder. The method of instrumental neutron activation analysis was applied to determine the following elements, As, Ba, Br, Ca, Cd, Cl, Co, Cr, Cs, Fe, K, La, Mn, Na, Rb, Sb, Sc, Se, U and Zn. Samples were irradiated at the IEA-R1 research nuclear reactor together with elemental standards for short and long periods. After adequate decay times, the irradiated samples and standards were measured using a hyperpure Ge detector connected to a gamma ray spectrometer. The radioisotopes measured were identified according to their half-lives and gamma -ray energies and the element concentrations o were calculated by comparative method.

The analysis of variance test applied to the results indicated that lichens from unpolluted sites of the Atlantic Forest present lower concentrations of As, Br, Ba, Cd, Co, Cr, Cs, Fe, La, Sb, Sc, U and Zn when compared with those from the Santo André sites. The highest concentrations of As, Ba, Cd, Co Cr, La, Mn, Sb and Zn were obtained in lichens from sites located near the industries. The lowest concentrations of As, Ca, Cr, Co, Sc and Zn were obtained from lichens collected inside the Santo André parks. The high concentrations of elements obtained in lichen from sites located near industrial areas indicated that the contribution of industrial pollution is higher than that from car pollution origin.

In conclusion, the results showed that the *C. texana* species may be used as indicators of air quality and as a biomonitor of trace element pollution in complex urban environments.