Sedimentary Profiles from a Water Supply Reservoirat São Paulo, Brazil: Trace and Rare Earth Elements Assessment by INAA

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A research project has been conducted by the Environmental Company of São Paulo State (CETESB) and the Nuclear and Energy Research Institute (IPEN) in important water supply reservoirs at São Paulo State in order to perform a wide evaluation on the content of rare earths and some trace elements in sediment profiles. In the present study, preliminary results for two sampling campaigns at the Graminha reservoir are presented:February/2015 (sites 1 and 3) and August / 2015 (sites 1 and 2). Sediment core samples (around 90 cm long) were collected in the dam and sliced at every 2.5 cm. Instrumental Neutron Activation Analysis (INAA) was applied to the sediment samples in order to determine some trace elements (As, Cr, Th, U and Zn) and rare earth elements (REE) (Ce, Eu, La, Lu, Nd, Sm, Tb and Yb). The analytical methodology validation was performed by means of certified reference material analyses. As, Cr and Zn concentration values were compared to the oriented values from CCME (Canada) (TEL and PEL). Sediment quality was classified as good or very good for these elements according these criteria. Enrichment factor (EF) and Geoaccumulation Index (*IGeo* index)[1]were applied to the results by using the concentration values of the last layer of the 90.0 cm profile as background values for sediment contamination index assessment. EF>1.5 was found for REE, U and Th in the middle of the sediment profiles,in all sampling points, indicative of anthropogenic contribution. *IGeo* values in the range of1<*IGeo*<5 were found, being the sediments classified as moderate to very polluted for these elements. The normalization of REE concentrations with respect to a geological reference value, a useful tool to obtain a comparison among information from contamination sources[2] was used in the present study by using NASC (North American Shale Composite) and PAAS (Post Archean Australian Shale) normalization as reference values. In addition, La/Sm, La/Yb and Sm/Yb ratios were calculated and discussed.The present study data are intended to start a sediment REE concentration data bank in water supply reservoirs and maybe they can be used in the future to establish legal limits for CETESB.

References

1. F.C. Gomes et al. Marine Pollution Bulletin, 59 (2009) 123-133.
2. P. Henderson, In Rare Earth Element Geochemistry, P. Henderson (ed.); Elsevier: Amsterdam (1984), p. 1-32.