

MINERALOGRAM – DETERMINATION BY NEUTRON ACTIVATION ANALYSIS FOR OCCUPATIONAL AND ENVIRONMENTAL STUDIES

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The mineralogram is generally obtained with the use of techniques like ICP-MS and ICP-AES, which are able to determine a considerable number of essential and toxic elements. In the Instituto de Pesquisas Energéticas e Nucleares (IPEN/CNEN-SP), - Comissão Nacional de Energia Nuclear, a nuclear technique, neutron activation analysis (NAA), is being applied as an alternative method to obtain data on mineral elements contents in human hair samples. NAA is characterized by a good sensitivity, as well as accuracy and precision and has been extensively applied to analysis of trace elements in biological samples., such as hair, nails, bones, lung tissues and others.

The elements that can be generally determined by NAA, using several experimental conditions, are: Al, As, Br, Ca, Cl, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Sb, Sc, Se, U, V, Zn. For quality assurance of the analytical results, several reference materials, like NIES 5 Human Hair, SHINR-HH Human Hair, IAEA-085, IAEA 086 and others were also analyzed by NAA and there was good agreement in general with certified values.

Hair samples from control individuals living in São Paulo have been analyzed by NAA, in order to contribute for the knowledge of the contents of many mineral elements in the Brazilian population.

A study was also made of contamination by mercury of Indian populations living in the Amazonic Region, using hair as a biomonitor. It was concluded that the concentrations of total mercury and methylmercury found in these populations were much higher than in the controls and this may constitute a serious health hazard due to the toxicity of mercury to humans.

Another work that is being conducted at IPEN/CNEN-SP using NAA and hair analysis is the evaluation of occupational exposure of workers by uranium, another element that may constitute a health hazard, being a very heavy metal and a naturally radioactive element. The contents found in hair and also in nails of these workers are being analyzed and compared with uranium concentrations found in populations non-exposed to uranium.

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