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Nuclear analytical merthods for studying elemental composition of calciofied tissuers

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Various nuclear activation techniques have been developed and applied to determine the elemental composition of calcified tissues (teeth and bones). Fluorine was determined by prompt gamma activation analysis through the 19F(p,aØ)16O reaction. Carbon was measured by activation analysis with He-3 ions, and the technique of Proton-Induced X-¬ray Emission (PIXE) was applied to simultaneously determine Ca, P, and trace elements in well-documented teeth. Dental hard tissues: enamel, dentine, cementum, and their junctions, as well as different parts of the same tissue, were examined separately. Furthermore, using a Proton Micro-probe, we measured the surface distribution of F and other elements on and around carious lesions on the enamel. The depth profiles of F, and other elements, were also measured right up to the amelo-dentin junction. A new technique has been developed for studying the depth profiles of F in teeth, non-destructively, to larger depths than hitherto known. It is further shown that using this technique depth profile of any element/isotope can be determined non-destructively as long as the reaction cross sections of the particular nuclear reaction are available.

Some results on the microscopic spatial distributions of various elements in kidney stones, using the powerful technique of Laser-Ablation Inductively-Coupled Plasma Mass Spectrometry (La-ICP-MS) are also presented.

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