Abstract Submitted
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Calculations of elemental concentrations in a lamb bone using optimal x-ray fluorescence measurements.[1] ALEX LAWSON, MIHAI GHERASE, California State University, Fresno — An optimal grazing-incidence position x-ray fluorescence (XRF) measurement method, previously developed in our lab, was employed to determine absolute elemental concentrations in a plaster-of-Paris (poP) bone phantom and a lamb bone. The poP phantom contained XRF-detectable elements with known concentrations: S, Ca, Pb, and Sr. XRF peaks of the following elements, in unknown concentrations, were observed in the lamb bone spectra: P, Ca, Fe, Zn, and Sr. Since only Ca and Sr were present in both samples, estimation of P, Fe, and Zn concentrations in lamb bone was not possible based on poP phantom data. Due to the x-ray beam size dependence on photon energy, conventional concentration calculations were also not in agreement with the known concentrations in the bone phantom. An ad-hoc method was derived to estimate the unknown concentrations in the lamb bone. Based on the poP phantom data, calculations were modified to include element-specific effective path length values to account for the incident photon absorption and the emergent XRF photon attenuation. The method was applied to the lamb bone measurements to yield elemental concentrations in agreement with values reported in the literature.

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