

# Structural and Compositional Study of Human Brain Tissues Using X-Ray Fluorescence and Mössbauer Spectroscopy

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**Abstract.** Human brain tissue samples were analyzed by energy dispersive X-ray fluorescence technique. Ten specimens were obtained from six male donors of age between 38 and 72 years. Lyophilized tissues were mechanically crushed into a powder form and pressed into pellets. Elemental analysis performed using Amptek Experimenter's XRF Kit identified the following elements: Al, P, S, Cl, K, Ca, Cr, Fe, Ni, Cu, Zn and As. The most abundant elements were P, S, Ca, Fe, and K. Some dependence of an element abundance on the age of a donor was observed for K (decreasing tendency with age) and for Ca and Zn (increasing tendency with age). XRF results were complemented and compared with Mössbauer spectroscopy measurements performed at room temperature (~ 300 K). Mössbauer spectra were collected in transmission mode employing <sup>57</sup>Co source embedded in a rhodium matrix. Applied evaluation procedure of spectra disclosed the presence of the trivalent ferritin-like iron, specifically ferrihydrite and hematite in molecule of ferritin in the form of small particles exhibiting superparamagnetic behavior. Relatively high linewidths values point at a distribution of environments with respect to electron density and/or a presence of another non-magnetic component. Anticipated correlation between the effect of Mössbauer spectra and iron content derived from XRF spectra analysis was confirmed.