Determination of the oxidation state of zinc and strontium in mineralized osteosarcoma tissue by in micro X-ray fluorescence XANES

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XANES measurements have been performed at the BAMline, BESSY-II synchrotron (Berlin) with respect to Zn and Sr in mineralized osteosarcoma tissue, a malign bone tumor. In a recent study an increased zinc accumulation in mineralized osteosarcoma tissue in comparison to surrounding healthy tissue has been found [1]. The data were compared with data obtained from healthy surrounding bone tissue as well various Zn compound samples. Further, hydroxyapatite samples containing different concentrations of Zn were compared. Two questions were investigated for Zn and Sr, respectively:

- Is there a noticeable qualitative difference in the XANES spectra when comparing osteosarcoma to adjacent healthy bone?
- Which of the reference samples fits the osteosarcoma XANES data?

For both examined elements there were no noticeable differences in the XANES spectra regarding the comparison of healthy to cancerous tissue. In the case of Zn none of the standard reference materials, e. g. ZnO or $ZnSO_4$, matched the tumor sample. However, strong similarities in the XANES spectra were found when comparing to hydroxyapatite (HA) samples containing different concentrations of Zn. The available HA samples containing Sr lead to similarly sound results, although these did not fit the osteosarcoma samples quite as well as was the case for Zn.

[1] Rauwolf, M., Pemmer, B., Roschger, A., Turyanskaya, A., Smolek, S., Maderitsch, A., Hischenhuber, P., Foelser, M., Simon, R., Lang, S., Puchner, S.E., Windhager, R., Klaushofer, K., Wobrauschek, P., Hofstaetter, J.G., Roschger, P., Streli, C., 2017. X-Ray Spectrom. 46, 56–62. https://doi.org/10.1002/xrs.2727