

## $\mu$ XRF spectrometer at Atominstitut for bio-imaging applications

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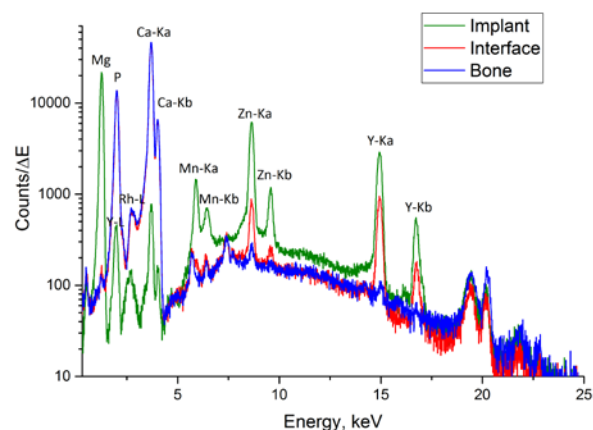
Micro X-ray fluorescence spectrometry ( $\mu$ XRF) is a powerful tool for determination of the spatial distribution of major, minor, and trace elements within a sample.

The  $\mu$ XRF setup at Atominstitut (ATI) was designed in-house and is suited for the detection of wide range of elements [1, 2]. The Rh-low power tube (20W) offers excellent excitation conditions for both light and heavy elements. The 30mm<sup>2</sup> Si(Li) detector, LN<sub>2</sub> cooled, with ultrathin polymer window (UTW), as well as operation under vacuum conditions are suited for analysis of light elements, e.g. magnesium. To focus the primary beam on the sample polycapillary optics (full lens) are used; the beam size determined for Cu-K $\alpha$  - 50x50 $\mu$ m<sup>2</sup>.

In confocal configuration, which is assembled by installing another X-ray polycapillary optic (half lens) in front of the detector, a depth-defined measurement is obtained, allowing determination of the spatial distribution of elements within a sample in three dimensions [3]. The beam size determined for Cu-K $\alpha$  in the system with confocal set-up is 50x50x50 $\mu$ m<sup>3</sup>.

The ATI  $\mu$ XRF setup has also an advantage of being a transportable system, therefore allowing use of synchrotron radiation as a source for experiments, thus considerably shortening the required measurement time and/or enabling scans of larger areas.

The samples under investigation - rat bone tissue with implanted pins, made of a bioresorbable alloy, were collected at given time points between 1 and 18 months after implantation, and thin sections (range of 150-550 $\mu$ m) were then embedded into PMMA [4]. The scans were performed in the areas, engaging the interface implant/bone and surrounding bone tissue (see Fig.1). The obtained elemental maps of magnesium and yttrium (the constituents of the implants) and calcium (the primary mineral component of the bone) in non-confocal and confocal setups, provide us with the relevant information on the degradation process [5].



**Figure 1:** Spectra of the characteristic points of biologically relevant areas of the sample.

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