Micro-XRF Analysis using Needle-Type Collimators

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A simple micro-X-ray fluorescence (XRF) method was proposed by using commercially available injection needles [1]. Two needles were arranged in confocal configuration inside the sample. One injection needle, which was connected directly to an X-ray tube, was used as an X-ray guide to irradiate X-rays into the sample. Another needle, which was also inserted into the sample, was used to detect the X-ray fluorescence excited inside the sample. The analyzing volume was evaluated to be 0.24 mm$^3$. Since the top of the needle injection is very sharp, it could be inserted into the soft materials. Therefore, the X-ray fluorescence emitted from a micro region inside the sample could also be detected. In the first stage of this experiment, the commercially available injection needles were applied [1]. However, X-ray fluorescence from injection needle itself was dominant peaks, because it was made of stainless steel. In the second stage, needle-type collimators were made of pure Ti tube at our laboratory [2, 3]. The linear calibration curves for a few elements were obtained using standard soft materials, which were made of vegetable gelatin including metals at certain concentrations. The detection limits were also evaluated from these calibration curves as several tens ppm.

References: