CONSTRUCTION AND APPLICATIONS OF THE KRAKOW X-RAY MICROBEAM

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INTRODUCTION

We would like to present construction of new X-ray microprobe which has been built at IFJ PAN in Krakow. This facility contains three experimental lines for:

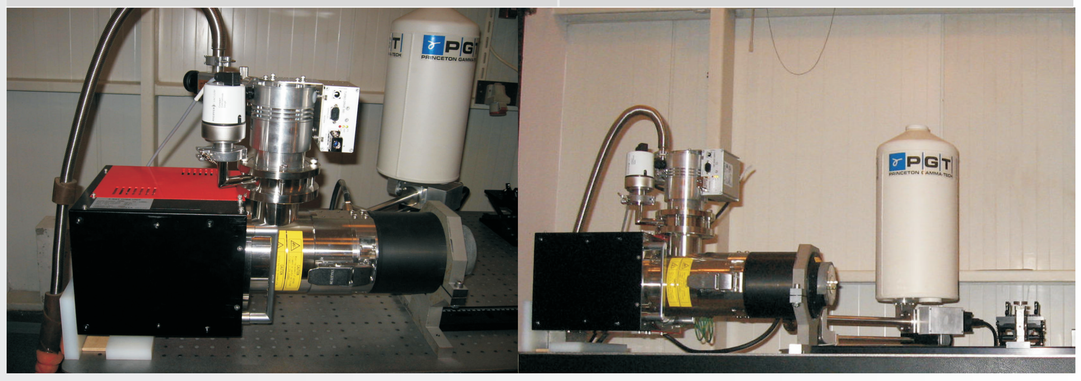
- microtomographic and tomographic experiments,
- micro X-ray fluorescence and total reflection X-ray fluorescence techniques
- target irradiation of single biological cells using well defined doses of X-rays

The microprobe is still under development. Preliminary results of tomographic experiments are presented

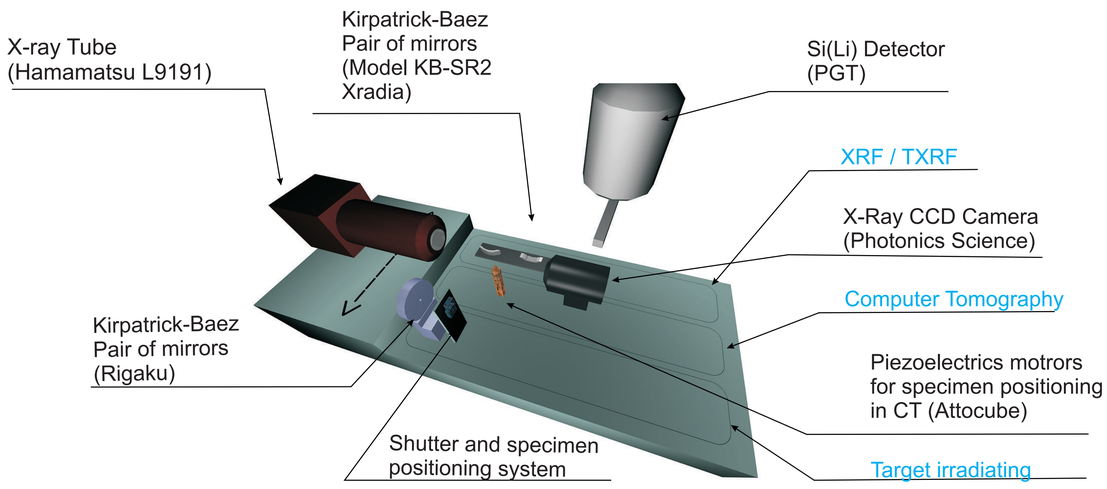
X-RAY SOURCE

As a source of X-rays an open type X-ray tube Hamamatsu L9191 with microfocusing down to about 2 μm is used, with the possibility of X-ray energy tuning by exchanging targets.

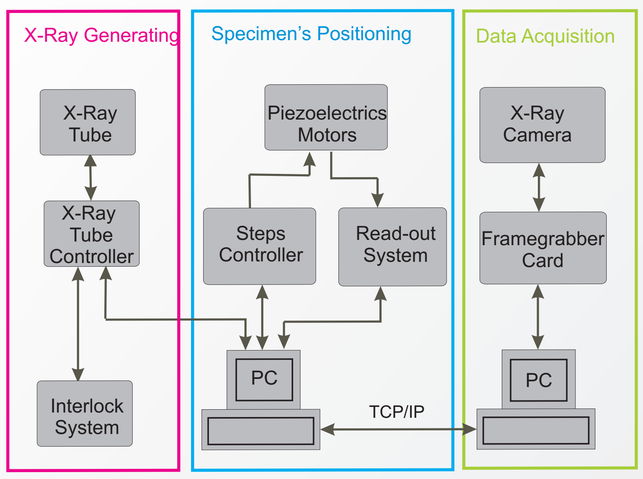
Parameter	Value
Cathode Material	Tungsten
Targets Material	Ti (Kα 4.5keV),Mo (Kα 17.4keV), W (Lα 8.4 keV, Kα 59.3keV),Ag(Kα 22.2 keV)
X-Ray Output Windows Material /Thickness	Beryllium / 0.5mm
X-Ray Tube Voltage Setting Range	20kV – 160kV
X-Ray Tube Current Setting Range	0 μA – 200 μA
Expected Resolution	2 μm
X-ray Beam Angle	120 degree



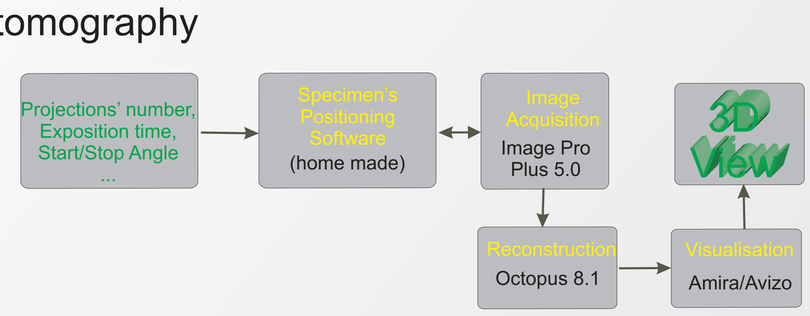
MICROPROBE ARRANGEMENT



MICROTOMOGRAPHY



Experimental arrangement and the associated electronics used for microtomography



Scheme of data flow and main software modules used in microtomography measurements.

Parameter	Typical Value
Number of projections	500 - 2000
Integration time of single projection	a few seconds – a few minutes
Total time of experiment	A few hours
Used X-rays energy	4.5 (K alpha -Ti) – 22.2 keV (K alpha -Ag)

PRELIMINARY RESULTS

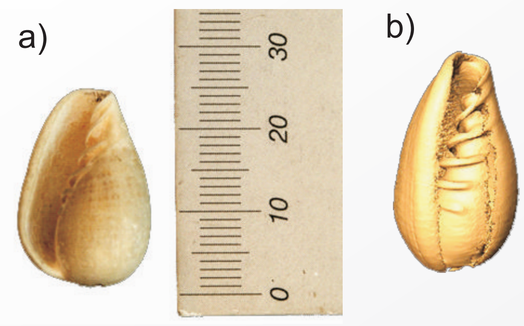
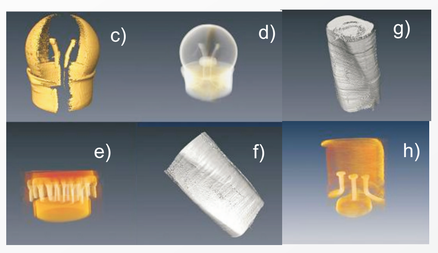
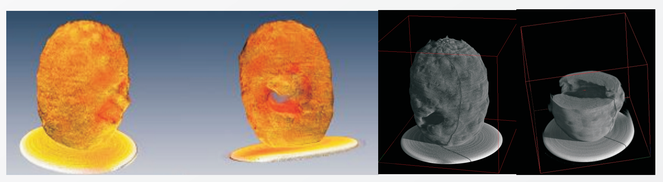


Photo of a shell (a) and its tomographic image (b).

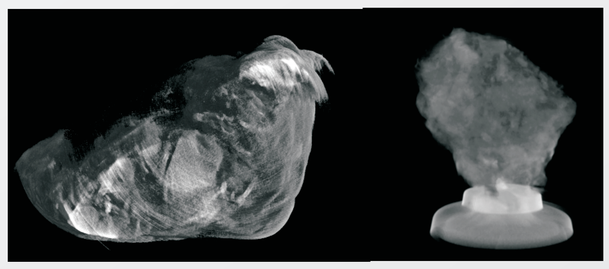


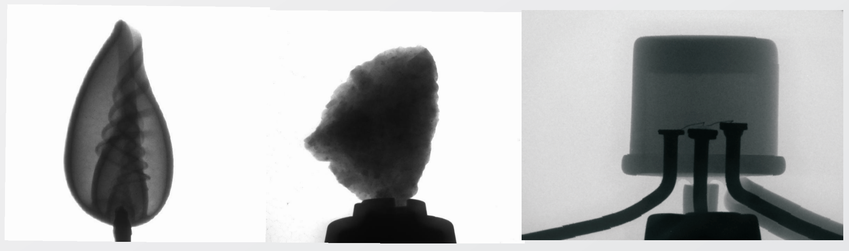
Tomographic image of:
a small bulb (c) and (d),
part of a drill ϕ=0,5 (f) and (g),
an integrated circut (e) and transistor (h).



Tomographic images
of a part of small cactus

Tomographic images
of sample of andesite





Examples of single projections