 ESRF	Experiment title: Test experiment on plasma sprayed hydroxyapatite coatings by high energy X-ray contrast tomography with micro-resolution	Experiment number: LS-880
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Report:

The hydroxyapatite, HA, calcium phosphate of chemical formula $(\text{Ca}_5(\text{PO}_4)_3\text{OH})_2$ is one of the biomaterials most used by the modern medicine as covering material for hip prosthesis. The most used deposition technology of the HA powder on the prosthesis is the plasma spray. The deposits obtained by this method are porous. We are concentrated in investigation of porosity, which is a very important parameter for the growth of osteoblasts on the coating. We have already performed SEM observation for large porosities, and we needed a high resolution in order to study the smaller porosities. Furthermore, we wanted to apply the micro tomography to other materials as bone, alumina and biological tissues, for which porosity is also an important characteristic.

In order to choose the best phase contrast condition, we recorded several images at different sample to detector distance (fig. 1).

The conditions of measurement were the following:

- 20 keV X-ray energy
- 3 cm distance
- flux: 3×10^4 ph/sec/mm²
- 20 sec exposure time
10 sec readout time
- 1250 projections

In the following we report the 3D reconstruction of the HA and bone samples (fig. 2,3), the cross section images of the HA, of the bone (fig. 4,5) and surface reconstruction of the bone (fig. 6). The results were very satisfactory as we got the information we were expected.

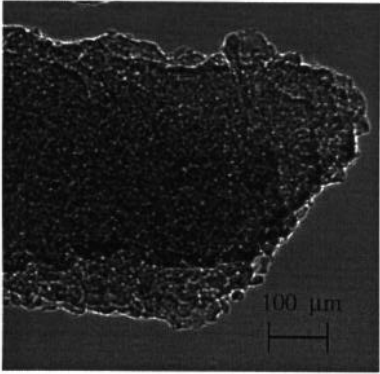


Fig.1

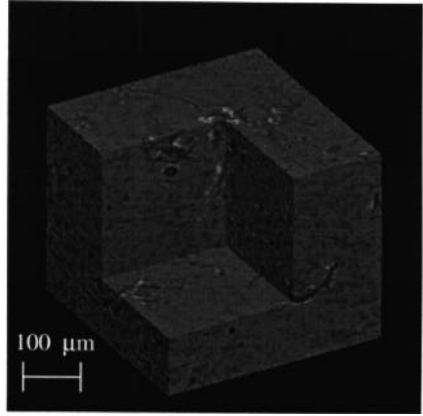


Fig.2

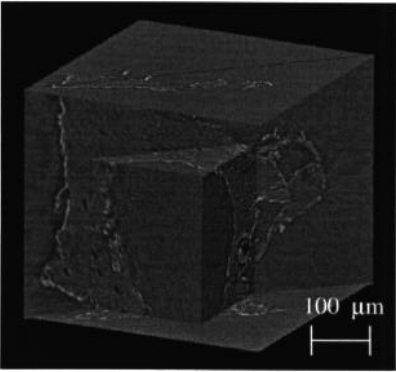


Fig. 3

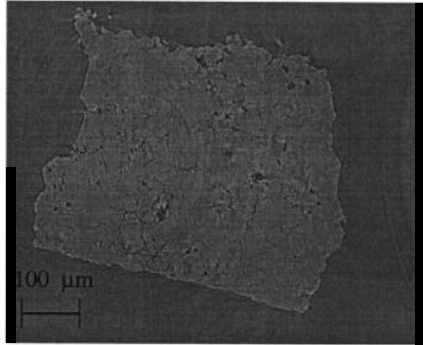


Fig. 4

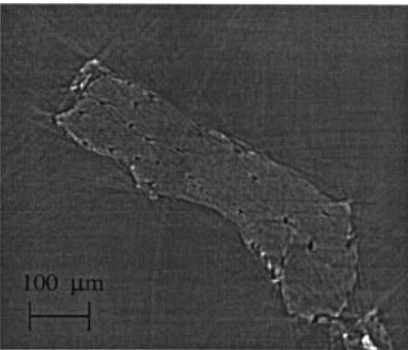


Fig. 5

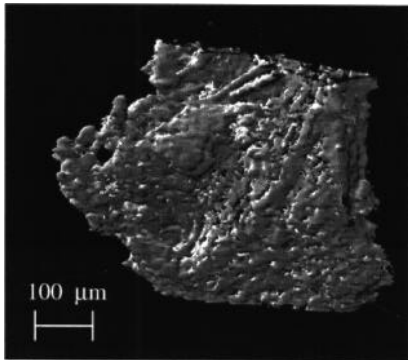


Fig. 6