Bone Diagnosis by X-ray Techniques

Lima, I.(a); Anjos, M.J.(b); Farias, M.L.F.(c); Rosenthal, D.(d); Duarte, M.E.L.(e) Lopes, R.T.(f)

a) National Institute of Metrology, Standardization and Normalization, DIMCI/DIMAT/ Materials Metrology Division, RJ, Brazil.
b) Physics Institute - UERJ, Brazil
c) University Hospital - UFRJ, Brazil
d) Biophysics Institute - UFRJ, Brazil
e) Histologic and Embriology Department - UFRJ, Brazil
f) Nuclear Instrumentation Laboratory, UFRJ, Brazil

Evaluation of biological specimens, such as bone of small animals can be accomplished with X-rays. The 3D microcomputed tomography (Micro-CT) is a non-invasive imaging technique that can produce a map of the structure it interns of the inspected sample, in microns order of the space resolution. The distinct advantage of using this imaging technique to characterize the internal structure of bone samples is that it is scalable for resolutions and is also useful for other that human specimens when higher resolutions are required. The parameters obtained by this technique were: bone volume ratio, trabecular separation number and thickness, superficial informations and the preferential trabecular degree (anisotropy). Another powerful technique used to inspect those kinds of materials is x-ray fluorescence (XRF), which is a superficial analytical technique that is accepted as an excellent method to analyze chemicals elements. A major goal for research in biomedical sciences over the last few decades has been to determine the concentrations of various elements in bone tissues.

In this work those two techniques work together, e.g., as a complement to each other, to characterize bones samples (human and animal). On the first moment the specimens were used to do the scan procedure in the microcomputer tomography that is located in the Nuclear Instrumentation Laboratory (LIN) – Rio de Janeiro, Brazil. The second step consist to do the x-ray fluorescence applying two different methods: energy dispersive x-ray fluoresce and x-ray microfluorescence. To the first method, it was used a usual experiment setup also located at LIN. The second method was executed at the National Synchrotron Laboratory (LNLS), in Campinas, Brazil.

The results show that 3D micro-CT and XRF are powerful techniques to analyze, inspect and characterize bone sample, they are alternative techniques to investigate bone structures and are complementary themselves. The micro-CT gives information about the internal and external bone regions even so its 3D visualization. The XRF, contributes to elucidate the elements presents in the external regions of the samples and beyond this provide those concentration and its bidimensional distribution.

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