ARTIFICIAL NEURAL NETWORKS AND ION BEAMS FOR 3D IMAGING

V. CORREGIDOR, L.C. ALVES, T. PINHEIRO, R.C. DA SILVA
DECN, Instituto Superior Técnico, Universidade de Lisboa, Lisboa, Portugal

M. FURTADO
MEFT, Instituto Superior Técnico, Universidade de Lisboa, Lisboa, Portugal

The nuclear microprobe (NM) together with Ion Beam Analysis (IBA) techniques allows obtaining 2D elemental distribution maps, providing also elemental depth profile along the ion path, with lateral micrometric precision and depth precision down to the tens of nanometer scale. Traditionally, Rutherford backscattering spectrometry (RBS) and particle induced X-ray emission (PIXE) are simultaneously used for sample characterization.

Typically, each scanned area by the NM is acquired as a 256x256 pixel map, each pixel containing all the IBA spectra recorded during the experiment. To analyse each spectrum individually would be tedious and time consuming. To solve this problem the use of artificial neural networks (ANNs), once trained, can be very important because they can handle the analysis of large data sets instantaneously [1-3]. From results obtained, it is possible to visualize in a 3D environment the sample composition variations.

Examples obtained from biological and archaeological samples will be presented, showing the versatility of the neural networks used. Their use can open the path for automated and/or real-time data analysis together with 3D reconstruction of sample elemental distribution and content.

REFERENCES

[1] BARRADAS, N.P., PATRÍCIO, R.N., PINHO, H.F.R., VIEIRA, A., Nucl. Instrum. Meth, B., 219-220 (2004) 105-109

[2] NENÉ, N.R., VIEIRA, A., BARRADAS, N.P., Nucl. Instrum. Meth, B., 246 (2006) 471-478

[3] BARRADAS, N.P., VIEIRA, A., Physical Review E, 62 (2000) 5818-5829