

## **X-Ray Fluorescence Analysis on paper characterization**

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### **Abstract**

Energy Dispersive X-ray Fluorescence (EDXRF) method was used to quantify S, Cl, K, Ca, Mn, Fe, Cu, Zn, As, Sr, Ba and Pb in identification of several kinds of modern papers and papyrus in order to identify them by its elemental content. This elemental characterization is extremely important in conservation of paper and forgery of old documents.

Ancient documents were also studied for comparison. For each modern paper 10 samples were analysed and in old documents 10 different points in each page were measured.

Different elemental compositions were observed in modern papers and in papyrus which allows to distinguish them. Concerning the old documents, its elemental content is different from the corresponding ones in modern papers for all the studied elements; higher concentrations for almost all elements, especially the heavier elements were observed. Moreover, it was possible to distinguish elemental differences in different pages of the same book identifying different processes of production and paper bleaching.

The used spectrometer is a non-portable one and is based on a secondary target and triaxial geometry. The detection limits are of the order of  $1 \mu\text{g g}^{-1}$  for trace elements which are good enough to detect the selected elements in the studied samples. This technique is non-destructive and has the advantage of quantifying the trace elements directly on the analysed paper. The drawbacks of this set up are that it is non-portable and microanalysis is also not possible.