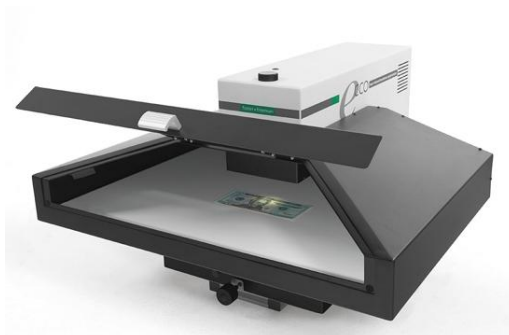


Discrimination of Office Paper using the ECCO-DE



The Foster + Freeman ECCO-DE featuring large document examination bed

Office paper is one of the evidence types most frequently encountered by forensic document examiners. Traditional analysis methods such as UV induced fluorescence, are subjective and can be affected by factors such as the age of the paper and ream variation^[1]. Here we present a study utilising the ECCO-DE laser induced breakdown spectrometer, to analyse and discriminate A4 office paper based on its elemental composition.

25 different brands of paper were subjected to analysis in the ECCO-DE. 6 spectra each consisting of an average of 3 laser shots were collected from each brand. All spectra were recorded in an argon atmosphere (typical flow rate 6 litres/minute) to improve the sensitivity.

Typical spectra of two papers is shown below in Figures 1 and 2:

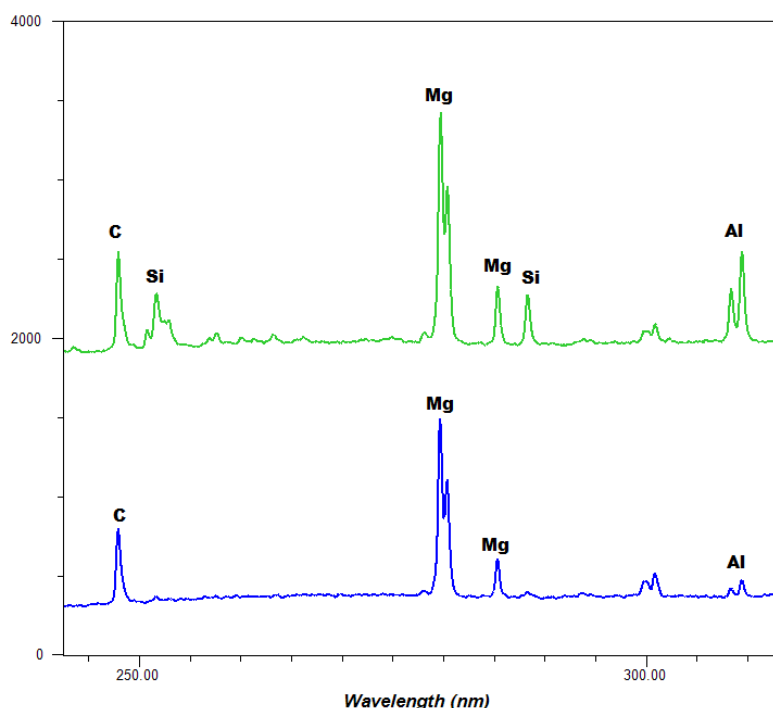


Figure 1 Spectra of 2 different A4 office papers showing difference in Silicon concentration.

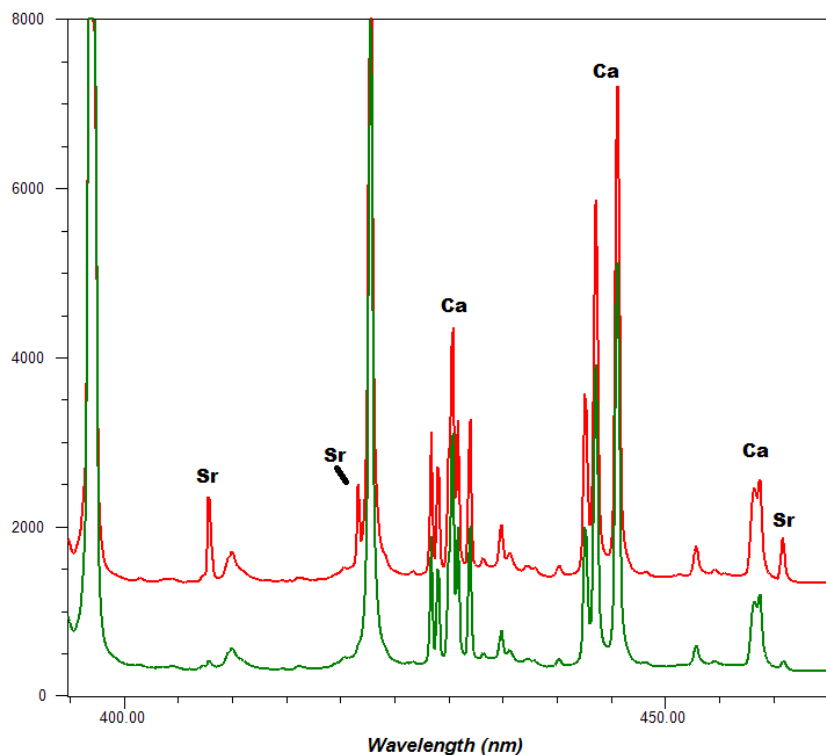


Figure 2 Spectra of 2 different A4 office papers showing difference in Strontium concentration.

Analysis

The following peak height ratios were measured for each spectrum. The reasons for choosing these ratios is discussed in a thesis by^[2].

Mg(279) : Ca(317)

Al(309) : Ca(317)

Sr(407) : Ca (445)

Sr(460) : Ca (445)

Na(589) : Ca (558)

To aid the analysis Hotelling's multivariate T^2 test^[1] was used for discrimination of the sample pairs. 90% of the sample pairs were successfully discriminated at 99.9% confidence using this technique.

[1] **Scientific Examination of Questioned Documents JS Kelly and BS Lindblom, Taylor & Francis 2006. Page 299.**

[2] **Elemental analysis of Paper using Laser Induced Breakdown Spectroscopy; a comparison with Ultra-violet Examination using a Video Spectral Comparator.**

Ciara Holland MSc thesis, University of Strathclyde 2010.

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