Non-destructive micro-EDXRF analysis for the fast characterization of authentic and counterfeit euro banknotes

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Beginning the 21st century, the euro was introduced as the common currency in the countries belonging to the European Union. Several financial EU institutions produced euro banknotes, which include many security features that can be easily checked simply by following the suitable procedures indicated by the European Central Bank. In spite of all these security characteristics, however, as soon as the euro appeared, counterfeit notes also began to emerge. The checking of authentic euro banknotes are based on the visual observation in reflected and transmitted light and on the perception, by touch, of the surface. Banknotes also include other basic security features (micro-lettering, see-through register, watermarks, security thread, iridescent stripe, UV sensitive inks ...) based on the response of different banknote drawings to light from the infrared and ultraviolet spectra.

In addition to these properties, the different parts of euro banknotes have some chemical fingerprints that can be fast and easily identified by micro-EDXRF, both by obtaining single spectra at sub millimetre level or by chemical mapping of selected parts of banknotes. We analysed some authentic and fake of 50 and 200 euro banknotes. The main objectives of this study were: a) demonstrate the usefulness and the potential of micro-EDXRF for the characterisation of authentic banknotes, based on the elemental composition of support paper and pigmenting inks, b) establish some basic procedures to clearly distinguish counterfeit banknotes.

![Figure 1](image.png)

Figure 1. (A) micro-EDXRF spectrum of yellow stars drawing in the 50 euros authentic banknotes, (B) Mapping of iron distribution in authentic 200 euros banknote numbering.

References