

TECHNOLOGY WATCH – Assessing new developments

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Characteristics

- Invisible markers – detectable with UV light
- Coded to give many possible unique combinations
- Additional security features

Invisible markers

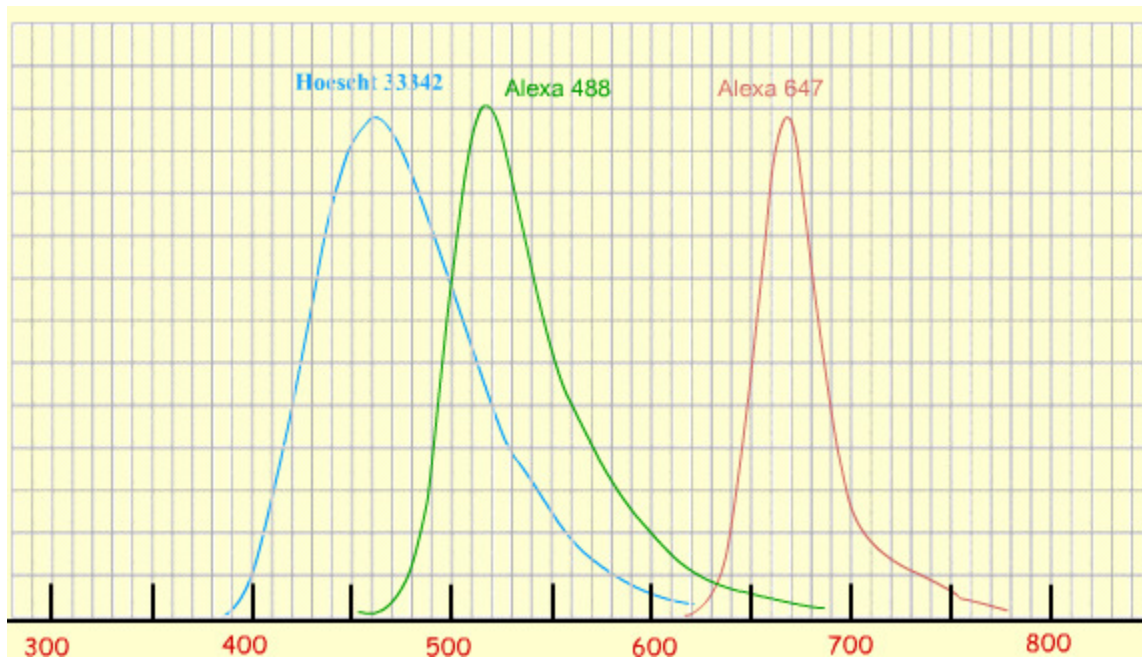
- Fluorescent organic compounds – detectable by UV light
 - Characteristic colours or emission spectra

- Metals – detectable by X-ray fluorescence
 - Characteristic X-ray spectra

- DNA – detectable by genetic engineering techniques

Fluorescent compounds

Fluorescence emission spectrum



Wavelength / nm

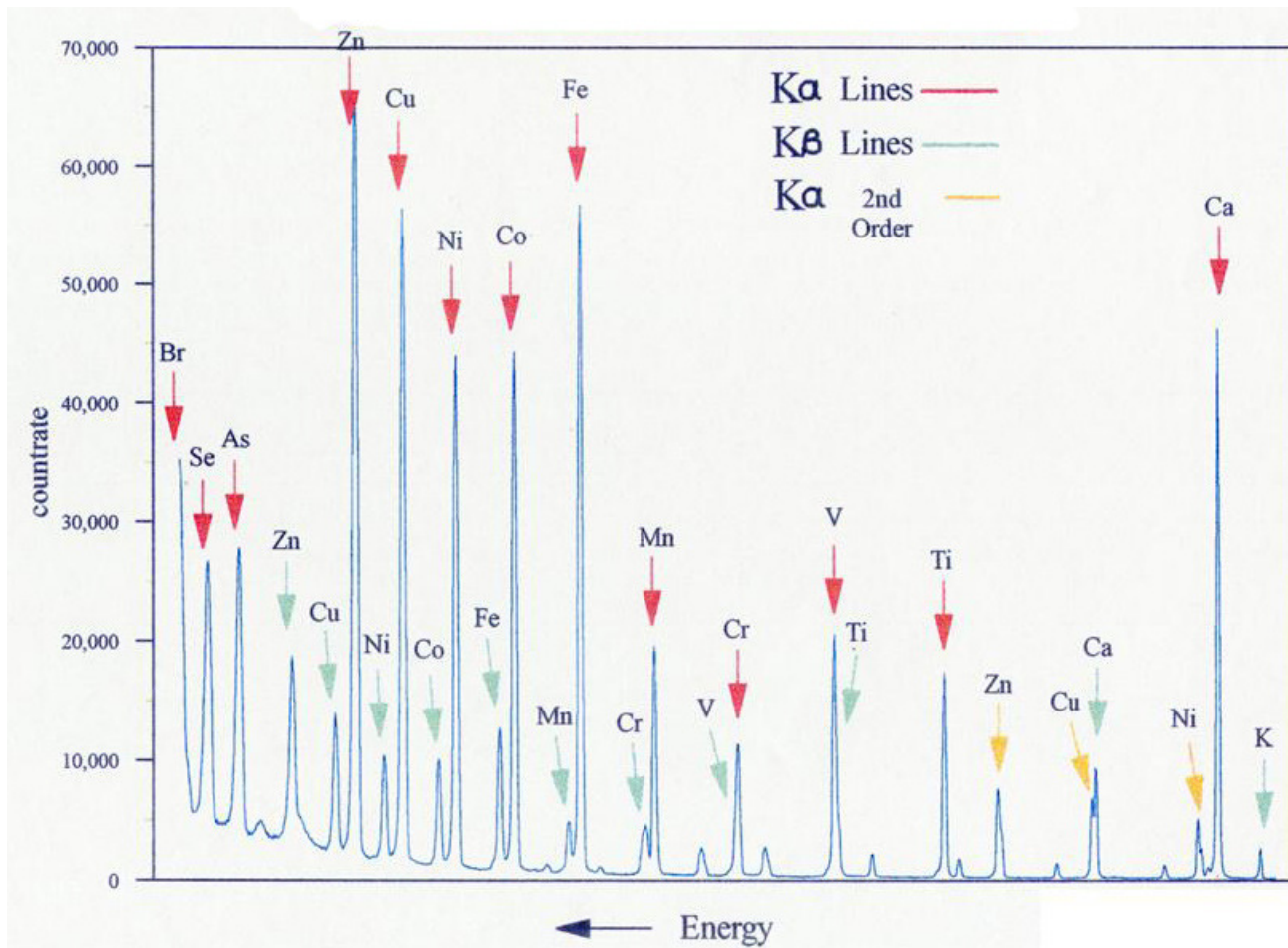
3 compounds –
present / absent → 8
possible combinations

Low/medium/high →
27 possible combinations

Many compounds →
very many combinations

Easily distinguishable
with a spectrometer

Metals



X-ray fluorescence spectrum

Transition metals:
9 elements \rightarrow 512
present / absent
combinations

19,683 low/medium/high
combinations

Lanthanides:
13 elements \rightarrow 8192
present / absent
combinations

1,594,323 low/medium/
high combinations

Easily measurable
with a portable
XRF spectrometer

DNA

Two key elements:

- Synthetic DNA markers:

Double strands of DNA with information coded by the base sequence, approx 100 bases long, flanked by specific key sequences at both ends.

- Primers:

Short double strands of DNA, approx 20 bases long, that recognise and pair with the key sequences.

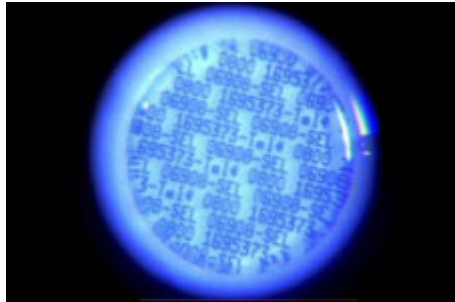
Details of the owner of each sequence are kept in a secure database.

In use, a solution of the DNA marker is mixed with an adhesive and a colourless fluorescent dye and painted onto the item to be protected.

DNA identification

- A sample of the adhesive containing the marker DNA is removed and mixed with a solution containing the primers.
- The primers recognise and bind to the key sequences on the marker DNA.
- The Polymerase Chain Reaction (PCR) is used to amplify the marker DNA. Even one molecule of DNA can yield a billion daughter molecules.
- The amplified DNA can be sequenced and the coded information read.

Additional features



- Microdots:

Less than 1mm diameter

Added to the adhesive

Contain a unique code plus contact telephone number

Questions for libraries

- How permanent is the adhesive – will it yellow?
- How permanent are the marker compounds?
- Is it feasible and acceptable to mark vulnerable items?
- Can the long-term availability of the database be guaranteed?
- Do these techniques reduce thefts?
- Do they aid the recovery of stolen items?