

ABSTRACT

This research is concerned with the detection and removal of hazardous biocide residues from historic applications to herbarium collections. There are two main aims:

- To develop a rapid, cost-effective and non-destructive screening method for identifying toxic residues on herbarium sheets; and
- To establish the most suitable decontamination method for the removal of naphthalene from herbarium collections, maintaining the integrity of the specimen.

The research outlines how the presence of fluorescent marks on specimen sheets throughout the herbarium, at Amgueddfa Cymru-National Museum Wales (AC-NMW), is indicative of mercury(II) chloride contamination. Compelling evidence is given to support the hypothesis that the observed fluorescence is due to the reduction of Hg(II) to Hg(I) during the oxidative degradation of cellulose, occurring as part of the natural ageing process. The rate of fluorescence development is shown to be increased by the presence of naphthalene, and is estimated to take at least 30 years to develop.

From the results obtained, it is evident that a hand-held UV-A lamp can provide a rapid and effective method of identifying samples within a collection that are contaminated with mercury, thus providing a rapid and economical means to prioritise which collections require immediate re-mounting. Furthermore, this method will enforce the implementation of safe, standard procedures to protect personnel and visitors when handling the collections, plus enable the removal of a large amount of hazardous chemical from the herbarium environment.

It is also demonstrated, through decontamination tests, that the air-drying of contaminated specimen sheets is a more efficient method of removing naphthalene, than either freeze-drying or oven-drying. It is also the most cost-effective, and the least damaging to the specimen. It is shown that the efficacy of the decontamination is dependent upon the paper type. Thin, unfinished, papers are more efficient at losing naphthalene than the heavier, finished and coated papers, as their porous structure allows the naphthalene to remain more mobile. These results provide important information about which specimen sheets are more likely to be successfully decontaminated by the air-drying procedure and can inform the selection and prioritisation process.