On the Use of Specimen Bags for Long-Term Storage of Geological Collections

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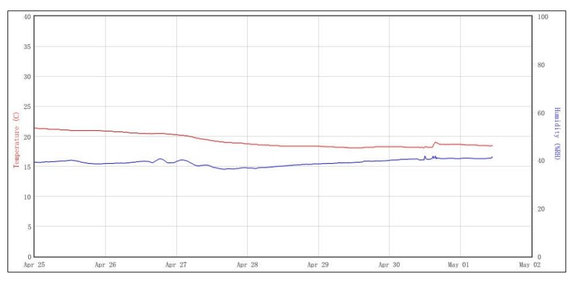
1. Introduction

Despite several publications issuing advice on the long-term storage of geological collections[1,2,3] there is no accepted International Standard and much of the guidance is generalised[4]. A recent survey of museum professionals looking at the use of plastic bags revealed a need and desire for more specific advice in this area. This paper collates and combines data with additional anecdotal evidence from over 20 institutions across Europe. The aim is to provide meaningful guidance **to be expanded upon for publication**. *Breathable plastics (such as polyethylene) are classed as 'Type A'; plastics that can create an anoxic environment (such as Escal Neo™ Gas Barrier Film) are 'Type B'.*

2. Store Conditions and Specimen Stability

Whilst a museum store's RH and T should be kept constant, this is often unrealistic and suggested parameters vary[1,2,3]. However, no single environment can accommodate an entire geological collection if the specimens require different conditions: Sub-fossil = >45 % RH; Unstable pyrite = <45 % RH[2].

Around 300 mineral species are susceptible to deterioration if stored inadequately[5] and regular monitoring of an entire collection is often impractical. Larkin *et al*.[6] recommend an assessment to identify problematic material (taking into consideration a store's specific conditions) which can then be pre-emptively dealt with in isolation using microclimates.



The relative humidity and temperature of most stores will fluctuate. © Horniman Museum and Gardens.

3. The Use of Microclimates (Type B Bags)

Sealed bags can create a microclimate which may be harmful to some specimens but entirely necessary in the protection of others such as for specimens exhibiting – or susceptible to – pyrite decay[7].

In the case of pyrite decay, oxygen barrier films such as Escal Neo™ Gas Barrier Film, a multi-layered polythene and polyester film with a ceramic coated polyethylene barrier layer, have been utilised with RP System™ oxygen scavengers to create anoxic/low oxygen environments. Escal Neo™ film can be heat-sealed to form sealed bags that can house vulnerable specimens. The film's transparency allows the fossil to be easily viewed for changes in condition. The addition of RP System™ Type K oxygen scavengers inside these Escal bags allows oxygen to be removed from the environment without lowering the relative humidity and risk drying out the fossil matrices[8,9,10].

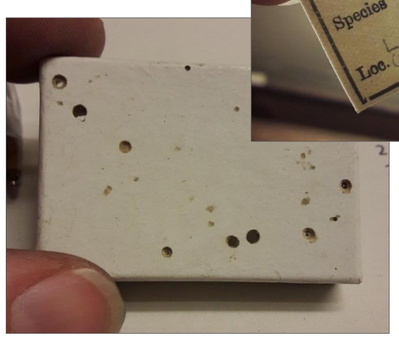
A sealed anoxic environment used to create a microclimate for unstable specimens. © Trustees of the Natural History Museum London.

However, the sealing of specimens containing minerals susceptible to pyrite decay (such as pyrite or marcasite) inside *Type A* bags can actually catalyse the disease[2]; polythene is gas permeable so the bag's internal oxygen and humidity levels cannot be controlled.

Here pyrite decay has damaged both the specimen and its label. © Horniman Museum and Gardens.

4. Further Notes on Type A Bags

Pros – For overcrowded drawers, Type A bags can help to avoid the disassociation of parts or labels. They also create an additional (though not-impenetrable) deterrent for pests.



Pest damage does occur in geological collections. Here woodworm has damaged the specimen box and label. © Horniman Museum and Gardens.

Type A bags will protect specimens from dust and water, and buffer against temporary fluctuations in RH. Whilst lidded boxes are preferable, the greater space they take up, as well as their greater cost, can render them a less practical choice.

This fossil collection is currently housed in over-crowded drawers. Type A bags have been used to avoid disassociation of parts and labels. © Horniman Museum and Gardens.

Cons – Abrasion is more common with bags than boxes. The white strip on Type A bags easily wears off and data can be lost. Type A bags can create unwanted microclimates and are gas permeable.

5. Conclusions

We strongly caution against a 'one rule for all' policy regarding the use of either type of bag (A or B) in the long-term storage of geological collections. To care for collections, whilst minimising the drain on resources and also being environmentally conscious, the following suggestions are made:

1. Identify the reliable RH and T parameters of your store.
2. Subsequently, identify and treat specimens that require a sealed environment (Type B).
3. Add material susceptible to pyrite decay into Action Two, to lessen the impact of fluctuating RH and T in the store.
4. Non-sealed Type A bags may be used to avoid disassociation, protect against dust and water, and buffer against temporary fluctuations in RH.
5. Due to the environmental cost (in both creation and disposal), we discourage the use of Type A bags unless specifically required. However, there is no reason to decant specimens already in Type A bags if the environmental needs of the specimens are met.

6. References

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