

# MuseumPests.net

A Product Of The Integrated Pest Management Working Group

## Oxygen Scavenger Treatment Fact Sheet

### Brief description of treatment

By depleting atmospheric oxygen levels to very low levels using reactive oxygen scavengers within an impermeable enclosure, a modified atmosphere composed almost entirely of nitrogen can be created. All developmental stages of insect pests can be eradicated if atmospheric oxygen levels within such an enclosure are maintained below 0.5% for a period of 21 days.

### What collections materials can be treated this way?

Most collections can be treated in this manner with the notable exception of materials containing Prussian blue dyes or pigments. Prussian blue is highly susceptible to fading and irreversible chemical change when placed in anoxic environments.

### General procedures

1. Construct an enclosure using a low-permeability barrier film such as Marvelseal 360, Aclar, Film-Pak, or Escal. All seams should be heat sealed and checked for leakage. The enclosure should be made large enough to accommodate a 20% reduction in volume of the enclosed air without damaging the object being treated. Care should be taken not to make the enclosure too large, as this may cause an undesired increase in the equilibrium moisture content of the enclosed object during treatment.
2. Place the object within the barrier film enclosure along with enough oxygen scavenger (Ageless or RP) to deplete the oxygen contained within the enclosure and to account for any additional oxygen which may permeate the enclosure during treatment. It is common practice to double or even triple the calculated amount of oxygen scavenger required to ensure effective treatment. Some practitioners recommend loosely wrapping the object to be treated in either washed muslin or acid-free unbuffered tissue. Some heat is generated as the oxygen scavenger reacts with oxygen, depending on the rate of the reaction. Care must be taken to spread the packets out and not to place them directly on or next to collections items.
3. Carefully pull air out of the enclosure with a vacuum. Seal the final seam of the enclosure. Check the enclosure periodically for shrinkage during the first few days of treatment. If the enclosure has been constructed and sealed properly, a 20% reduction in the volume of the enclosed air mass should be observable by the third to fifth day.
4. Keep the enclosure sealed for 21 days. After 21 days the enclosure may be opened, and the object can be removed.

### Pros and Cons of this treatment

- Pros
  - Relatively simple and inexpensive.
  - Appropriate for a wide variety of collection materials.
  - Oxygen scavengers are not registered pesticides; no licensing is required.
- Cons
  - Requires a relatively long period for treatment.
  - Care must be taken to properly construct and seal the enclosure.
  - Care must be taken to select the proper oxygen scavenger. Some oxygen scavengers contain an added desiccant (e.g. RP Type A), which could decrease the equilibrium

- moisture content of objects during treatment.
- Not appropriate for use on materials containing Prussian blue pigments or dyes

### Supplies needed

- Oxygen scavenger such as Ageless or RP Systems.
  - Note that while the manufacturer suggests using Ageless Eye as an indicator for oxygen levels, results are variable and it may be more practical to use an excess of scavenger for the recommended 21 days.
- Low-permeability barrier film such as Marvelseal 360, Aclar, or Escal.
  - There are pros and cons with each of these materials: Marvelseal is not transparent, so the object is not visible within the enclosure, but it is easier to evaluate the quality of the seal. With the transparent films Aclar, and Escal, the object is visible in the enclosure but it is more difficult to evaluate the quality of the seal because pinholes and gaps are not as visible. Finally, it takes longer to create a seal with Marvelseal than with the transparent films. Some users choose to use two barrier films: a clear film such as Aclar or Escal for the front side so that items and monitors inside the enclosure will be visible during treatment, and an aluminum barrier foil such as Marvelseal 360 for the back side.

### Selected bibliography

Brandon, J. and G. Hanlon. 2003. A low tech method for insect eradication using Ageless. Wooden Artifact Specialty Group Postprints, American Institute for Conservation 31<sup>st</sup> Annual Meeting, Arlington VA. [http://aic.stanford.edu/sg/wag/2003/brandon\\_hanlon\\_03.pdf](http://aic.stanford.edu/sg/wag/2003/brandon_hanlon_03.pdf)

Burke, J. 1996. Anoxic Microenvironments: a simple guide, SPNHC leaflet 1(1): 1-4. <http://www.keepsafe.ca/jburke.shtml>

Burke, J. 1992. Vapor Barrier Films. WAAC Newsletter. Volume 14, Number 2, May 1992, pp.13-17 <http://palimpsest.stanford.edu/waac/wn/wn14/wn14-2/wn14-204.html>

Daniel, V. and F. L. Lambert. Ageless Oxygen Scavenger: Practical Applications. WAAC Newsletter. Volume 15, Number 2, May 1993, pp. 12-14 <http://palimpsest.stanford.edu/waac/wn/wn15/wn15-2/wn15-206.html>

National Park Service, May 1999. Conserve O Gram Number 3/9: Anoxic Environments: A Treatment For Pest Control. <http://www.nps.gov/history/museum/publications/conserveogram/03-09.pdf>

### Product suppliers

Ageless oxygen absorber, manufactured by Mitsubishi <http://www.mgc-a.com/ageless/ageless.html> is available from several museum supply companies (check the internet for availability.)

RP system scavengers manufactured by Mitsubishi, <http://www.mgc-a.com/rpsystem/mgca.html> is available from several museum supply companies (check the internet for availability.)

Escal film is manufactured by Mitsubishi RP system <http://www.mgc-a.com/rpsystem/bags.html> and is available from several museum supply companies (check the internet for availability.)

Marvelseal is manufactured by Berry Plastics/Covalence Coated Products (formerly Ludlow Corp), <http://www.covalencecoatedproducts.com/en-US/default.aspx> and is available from many museum supply companies (check the internet for availability.)

Aclar film is manufactured by and available from Honeywell International, Inc., Specialty Films <http://www.honeywell.com/> and it is also available from Keepsafe Systems Inc. <http://www.keepsafe.ca/>