



Perplexing Plastics

By Tamara Hemmerlein, Director, Local History Services

Museum collections should reflect the history of communities. Objects are representative of how we live, what we do, and what we use. Plastics are an inevitable part of our collections and caring for them is complex and challenging.



[Satin Tress Perm Crème Neutralizer](#) (Madam C.J. Walker Supplemental Collection, Indiana Historical Society)

Plastic was developed fairly recently, and we are still learning about the long-term care of plastic objects and composite objects with plastic components. Plastics are made up of a variety of polymers with myriad differences in chemical composition. The variance in the polymers means that it can be difficult to determine how plastics will change, degrade, and affect other objects over time. Newer plastics can be less problematic due to the increased use of effective stabilizers.

Different objects will degrade at different rates and preserving them may require different environmental conditions. Some plastics become yellow as polymers react to environmental conditions that cause changes. Other plastics turn gooey. Still others shrink or begin to look dusty or chalky. Objects containing plasticizer (an additive that makes plastics flexible) become stiff and brittle as the plasticizer evaporates, polymer molecules are rejected by the plasticizer causing crosslinking (a process where one or more molecules attach to other molecules to create new links causing physical changes), or the plasticizer becomes more or less soluble over time. Polyvinylchloride, cellulose nitrate, and cellulose acetate are especially affected by these processes.

Decomposition can be caused by exposure to water and the subsequent reaction (hydrolytic deterioration). Polymers that react with water vapors in high humidity will degrade more

rapidly. Deterioration in plastics, like other materials, is caused by reaction to oxygen in the air (oxidation).

As certain types of plastics degrade, the vapors that are released into the air can affect objects stored and/or exhibited around the plastic objects may be affected and begin to degrade as well. Objects stored in enclosed environments are trapped with the vapors and are especially susceptible to damage over time. While there is no way to halt the degradation, it can be slowed.

To slow the degradation, it's important to try and ascertain the type of plastic and the materials used to make it. For example, methyl methacrylate is a relatively stable plastic while cellulose acetate releases acidic vapors as it decays. To identify the composition of plastic objects, look for clues on the objects themselves – trademarks, manufacturer names, production numbers, etc. Then begin researching the manufacturing history of the objects. A colleague of mine once called a company and spoke to someone about the composition of plastic tubs. The individual she spoke to shared non-proprietary information once she explained why she was asking.

As with many other objects, the best way to care for plastics is to store the objects in the best environment possible for them. Monitor environmental conditions. Develop a regular object condition checking schedule. Have a plan for modifying storage and exhibit situations if necessary.

When it comes to our collections, we should remember that preservation is a way to prolong the life of objects that were often meant to be used and used up. With plastics, the goal is to do the best we can for as long as we can.

Resources

[Care of Objects Made from Rubber and Plastic](#) (Canadian Conservation Institute)
[Preserving Plastics](#) (National Museum of American History, Behring Center)
[Care and Identification of Objects Made from Plastic](#) (National Park Service)
[Fantastic Plastic](#) (University of Cambridge Museums & Botanic Garden)

Further Resources

[Collections Advisors](#) (Indiana Historical Society)
[Timely Tips](#) (Indiana Historical Society)

Collection Trainings

[Strategies for Born Digital Collections](#)
Aug. 6 (Northeast Document Conservation Center)
[Archival Value](#)
Aug. 10 (Backlog)
[New Tools to Create Dynamic Collections Resources for Your Organization](#)
Aug. 11 (Conservation Center for Art and Historical Artifacts)
[Preserving in the Now: Archiving in Times of Crisis](#)
Aug. 12 (Connecting to Collections Care)

[Exhibiting Your Collections](#)

Aug. 25 (Northeast Document Conservation Center)

Recorded Webinars

[Connecting to Collections Care](#)

[Indiana Historical Society](#)

[Northeast Document Conservation Center](#)

[Texas Historical Commission](#)

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(317) 232-1882 | localhistoryservices@indianahistory.org