

Sarah Stauderman answers some questions we were unable to get to from her webinar, Audio Recording Identification and Preservation, on Monday, October 21, 2013.

Q: Laiyee (Singapore): What is safest way of labeling discs?

A: For CDs and DVDs, the Council on Library and Information Resources' Care and Handling of CDs and DVDs: A Guide for Librarians and Archivists (Fred R. Byers, October 2003), section 5.2.5 'Marking', recommends using a non-solvent pen only on the clear inside hub of the disk. A pen for this purpose is sold by the Electronic Media Group of the American Institute for Conservation: <http://cool.conservation-us.org/coolaic/sg/emg/pen/>

For grooved recording discs, they should not be marked if possible. For marking the recording, utilize the sleeve that houses the disc. In some cases it might be necessary to lightly write in pencil at the label area an accession or catalog number.

Q: What's the reasoning behind storing discs vertically?

A: The rationale for storing discs vertically is that horizontal pressure distorts the discs and especially the grooves. The content is in the groove, and even small distortions created by pressure can permanently damage the sound. Very tall stacks of horizontal discs will especially damage the disc on the bottom layers, and possibly warp or break them. Finding and sorting discs when they are stacked is also a problem. One important point to storing items vertically is that they should be absolutely upright with support bars or braces between groups of them. This is described more specifically in *A Manual of Sound Archive Administration* (Alan Ward, 1990).

Q: Ani (Toronto): Is there a way to reverse the vinegar syndrome, or conserve an audio or film that already has vinegar syndrome? Usually, we do not accept materials that are already at that stage.

A: Vinegar syndrome is not reversible, but there are strategies for dealing with this problem in our cultural heritage arena. There is extensive discussion regarding vinegar syndrome of photographic films especially at research organizations like the Image Permanence Institute:

https://www.imagepermanenceinstitute.org/webfm_send/308

Some of the ideas discussed are translatable to magnetic media on cellulose acetate. The only way to delay or stop the process is to put objects into cool or cold storage. Remember, magnetic media cannot be frozen, so you must compromise on the temperature and place it in cool storage (46F). To reduce the odor and to provide some stabilization of vulnerable materials the use of adsorbents (e.g. molecular

sieves) added to sealed enclosures scavenge some of the acidic degradation byproducts and reduce the moisture content in the object. This is a temporary stabilization method, and it is extremely important that reformatting proceeds in a timely fashion with items that have this problem. Audio and film with vinegar syndrome have one other important issue which is that they shrink as the syndrome progresses; this shrinking may make it very difficult to reformat except with specialists who have the proper equipment or who can do the work almost manually. As a result reformatting as soon as possible is key.

Q: Mary (Ontario): What machinery was needed to make a recording on an unpublished disk?

A: It is essentially the same as for published discs, but the final result is unique (not used as a matrix for a mold to produce multiple copies). A microphone or audio amplifier (a horn or tube) is connected to a sensitive device such as a diaphragm of a material (foil) which responds to the waves of sound. The diaphragm moves in response to the wave and is connected to a stylus (in metal or bone), which then cuts a groove into a disc made of metal or coated with film (as in acetates).

Early disc machines were the Gramophone, the Edison phonograph, and the Graphophone.

Q: Gerhild (Germany): Roughly how many types of polyurethane mixes according to different brands, and what are the main chemical ingredients?

A: With regard to the number of formulations of polyurethane used in the manufacture of magnetic media, this is a great question, and unfortunately simply unknown. The mixes used to create the binder are “proprietary” which means that they are industrial secrets unique to the manufacturer. The basic chemical formulation for polyurethane is this: $R_1-NH-C(=O)-O-R_2$

R = an extension of the Carbon Chain

N = Nitrogen

H = Hydrogen

C = Carbon

O = Oxygen

Where the carbon and oxygen are double-bonded is where acid-hydrolysis occurs which breaks the polyurethane chain and changes its physical properties such as its molecular weight.

Q: Elizabeth (Massachusetts): Could you mention some specific videotape formats that used Barium Ferrite?

A: Alas, I cannot remember the name of the company that marketed tapes formulated with barium ferrite as an “archival” solution for long-term preservation of videotapes in the mid- to late 1990s. While the concept of the formulation was that barium ferrite is extremely stable, and therefore provided a superior recording surface, the issue for videotapes has always been first with the binder (i.e. the polyurethane), not the pigment. Barium ferrite’s stability and its qualities of hysteresis and remanence (the ability to be erased and the ability to hold a magnetic field after the field has been removed) are very good. Barium ferrite is used in data tape applications currently.

Q: Laiyee (Singapore): What sets 'archival standard' disks from standard ones in terms of chemical composition?

A: Another excellent resource for CDs and DVDs can be found with the Canadian Conservation Institute’s CCI Notes (19) <http://www.cci-icc.gc.ca/publications/notes/19-1-eng.aspx> In addition, studies performed by the National Institute of Standards Technology demonstrated that dye type CD and DVD media are more stable, especially phthalocyanine gold-silver alloy types. Azo dye and cyanine dye disks were not as stable.

<http://www.itl.nist.gov/iad/894.05/docs/StabilityStudy.pdf>

Another one of the features of good quality CDs and DVDs is that they should be manufactured with very few error rates. Even a well-manufactured disk made of the appropriate materials can come with high error rates embedded in them. Test your disks to be sure that they do not have a high error rate out of the box.

While the medium is excellent for distribution and access purposes, I do not recommend using CDs and DVDs as a permanent storage medium for audio. In 2013, the state of the art is to use Digital Asset Management systems that have a media asset management component in data tapes, servers, or a combination; cloud computing and cloud storage are also becoming part of the equation.

Q: Gerhild (Germany): Cures for magnetic audio track peeling off Super8?

A: This is a terrible problem, and I am unaware of any consolidation technique that would reattach the audio track to the film base; however, it might be possible to readhere with some consolidant used in film/photograph conservation immediately prior to reformatting. Reformat as soon as possible and see if you can locate a separate audio track elsewhere (but unlikely as Super 8 is usually created simultaneously with the audio).

Q: Mary (Colorado): Is there any listing of tape manufacturers and when there were changes in manufacturing process and formulations?

A: I believe that several retired engineers from tape manufacturing companies such as Ampex and other audio and video engineers had started a list about a decade ago, but I'm not sure where it is located. I would check with the Association of Moving Image Archivists, and its listserv (<http://amianet.org/community/list-serv>) or with Association of Recorded Sound Collections (<http://www.arsc-audio.org/index.php>)

One important point that I wasn't able to make during the webinar is that cassette tapes manufactured with CrO₂ (so called Chrome tapes) formulations have a tendency to deteriorate faster. Some research indicates that the Chromium accelerates hydrolysis of the polyurethane binder. This was a prevalent medium for cassette tapes (also known as compact cassettes) from about 1979 to 1990.