



Stamps and Plastics - the Good and the Bad

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Archival or Safe?

- "Archival" is an imprecise non-technical term that has no exact definition. In other words, "archival" and "safe" are relative terms unless there are scientific standards to back them up.
- There are apparently no test results available from the various suppliers on the relative safety of their products for philatelic collectibles. In other word, we must simply trust them that their products are "safe".
- There is a lot of misinformation available from reputable sources on plastics in the hobby. For example, "PVC films exude hydrochloric acid (or gaseous chlorine) at room temperature."
- Most information is anecdotal not scientific. Example, "My stamps have changed color over the years."



Plastics – Archival or Safe?

- There are relatively few scientific test results available on the long term protection afforded stamps and covers by currently used plastic materials. The Arthur Salm Foundation in their report #3, 1995, stated,

“The Foundation has studied several publications issued throughout the world in several languages during the past fifty years evaluating "protective films" as they are used in philately. We have translated, examined and discussed each one very carefully. Further, a rather extensive laboratory evaluation of various plastic materials was made and a 30-page report was submitted to the Board of Directors of the Salm Foundation. After careful and sincere study by the Foundation's board of polymer experts, it was found lacking in several important areas and unscientific in its experimental conclusions. This study will not be released.”
- The exception is “Stamps in Plastics, Three Year Oven Test”, by Dr. William Souder as published in *The American Philatelist* in April 2005.



Stamp Mounts and Pages Need to:

- Protect philatelic materials from dust and not cause damage due to humidity and heat under normally expected conditions.
- Should not change with time to become yellowed, brittle, etc.
- Mounts should be clear
- Have adequate stiffness
- Should not change dimensions (shrink)
- Should be easily fabricated
- Inexpensive



Stamp Mounts and Pages Will Not Protect Against:

- Simple age. Some inks change color through simple oxidation or the interaction with naturally occurring pollutants (e.g. sulfur oxides).
- Mistreatment. Exposure to high humidity or temperatures for extended periods of time (e.g. tropical conditions). Stamps “want to live where we do”.
- Non-archival album or mounting pages (e.g. acidic paper)
- UV light (e.g. sunlight, whether direct or otherwise). Plastics and normal glass do not shield stamps/covers from UV.



Plastic Currently Used in Stamp Collecting

- Rigid (unplasticized) PVC (polyvinyl chloride): clear, stiff, easily fabricated, doesn't shrink, inexpensive. If not properly formulated, can cause serious problems, but has long history of safety.
- Polystyrene (PS): Clear, relatively stiff, easy to fabricate, can shrink, doesn't change color with age.
- Polypropylene (PP): Clear, medium stiffness, moderate ease of fabrication, doesn't shrink, doesn't change color with age.
- Polyester (PET) (Mylar-D): Clear, stiff, difficult to fabricate, doesn't shrink, doesn't change color with age.
- Polyethylene (PE): Somewhat cloudy, Soft, easy to fabricate, doesn't shrink, doesn't change color with age.

Suppliers' Types

(Taken from their websites)

PVC

- **SAFE:** “100% free of plasticizers (chemical softening agents) and free of stearates. The foil used does not contain plasticized PVC.” Elsewhere on website: “(= *vinyl* = foil)”
- Albums: “The grey-black colored *vinyl* optically separates the stamp in the front from the stamp in the back, creating a dark contrast background for both stamps. Yet, you will still clearly see the illustration underneath the *vinyl* stock page.”
- **Lindner:** “UNIPLATE stock sheets are made of the highest quality material — *Hard-PVC* which is 100% free of any chemical softeners.”

Suppliers' Types

Polystyrene

- **Hawid** (from Subway website): "...sheets of oriented *polystyrene* foil."
- **SAFE**: "SAFE Mounts are made by Hawid." "Made of 100% inert *polystyrene*, containing no softening agents."
- **Blue Rose** (from Subway website): "...sheets of oriented *polystyrene* foil."
- **Showgard** (from Subway website): "Made of oriented *polystyrene*, containing no agents that might be harmful to postage stamps."
- **Scott** (from Subway website): "Made of 100% inert polystyrol foil." (i.e. *polystyrene*)
- **Crystal-Mounts** (polystyrene) From H.E. Harris, no longer being made, but still being offered on eBay.

Suppliers' Types

Polypropylene

- **Lindner** (from Subway website): “The glassine stock books are made from the finest black or white board with transparent virgin glassine or crystal-clear Polypro strips.” (i.e. *polypropylene*)
- **Supersafe** (from Showgard website): “SuperSafe Album contains the patent pending 3-layered page that sandwiches a sheet of richly textured jet black archival PolyPro film between 2 layers of crystal clear PolyPro film. No noxious PVC or acetate...” (i.e. *polypropylene*)

Polyester

- **Hagner** (Philatelic Distributors Ltd. website): “Hagner stamp stock sheet system ... The *polyester* pockets block ultra violet light which stops fading and repels moisture.”

No Information

- **Lighthouse (KABE)**: “This is a special development of a transparent pocket which protects the stamp of mechanic and atmospherical (*sic*) influences.”
” ... crystal-clear pockets in varying dimensions and are 100%-free of acids or chemical softeners.” Lighthouse uses a variety of materials depending on the products usage. See http://www.leuchtturm.com/WebRoot/Store/Shops/leuchtturm_eu/PDF/produktinformation_en.pdf.



“Stamps in Plastics” Article

Test Procedure:

- Variables were 125 U.S. stamps representing years 1900-2000, all types of ink colors, perforate and imperforate, tagged and untagged, types of printing, etc.
- Selected were commercial samples of generic plastics commonly used as philatelic protectors (mounts, pages, etc.) including plasticized PVC, unplasticized PVC, polypropylene, polystyrene and Mylar-D as well as glassine envelopes and Mylar-paper fabricated pages.
- Seven sets of stamps were mounted in stock pages fabricated from each of these varieties and put into test as well as a set held at room conditions as a control.
- All seven pages were put into a glass tray and weighted with another glass tray with 15 lbs. of glass beads duplicating the conditions of albums stacked upon each other.
- They were put into a temperature/humidity controlled lab oven for three years with inspection after each year. The temperature was varied between 75 and 95°F and 75 and 85% relative humidity over each 24 hour period.



The Good News

Ratings:

- Plasticized PVC pages were buckled and brittle. As expected, nearly 1/3 of the stamps had ink transfer or color changes.
- Unplasticized PVC pages had only three stamps with ink transfer or color changes.
- Polystyrene pages were buckled and shrunken. No stamp color changes were noted, and only one stamp had ink transfer.
- Polypropylene pages had no stamps with ink transfer or color changes.
- Mylar-D pages had only three stamps with ink transfer or color changes.
- Glassine envelopes were degraded (yellowed, stained, brittle) to the point that the stamps were not rated. All gummed stamps were fused to the envelopes.
- In general, self-adhesives stamps had sticking as an issue.
- All varieties had significant numbers of stamps that had gum issues such as disturbances, glazing, or sticking (self-adhesives types)



Comments

- This was not an archival test. It only evaluated what might be expected with these materials in normal usage over a rather short period of time.
- As might have been expected, the humidity seemed to cause no issues with plastics with the exception of gum glazing and disturbance.
- As might have been expected, the horizontal position of the “albums” caused gum disturbance.
- Higher temperatures of non-controlled storage areas such as attics, auto interiors, etc. would be expected to cause more problems.
- Nothing can be projected as to the effects of longer periods of testing.



PVC Myths

- **“PVC films exude hydrochloric acid at room temperature.”** This results from confusion with thermally unstabilized PVC polymers. Products made from unplasticized PVC polymers are thermally stabilized to 275⁰F and cannot exude anything at room temperature. Salt contains chlorine, but no one thinks of it is a poison. Mylar is made from permanent alcohol (ethylene glycol), but no one argues that it exudes an oily substance at room temperature.
- **“PVC films release chlorine gas as they degrade.”** As above, thermally stabilized PVC polymers do not degrade at room temperature.
- **“PVC has loosely bound chlorine atoms that can attack stamps.”** As above, stabilized unplasticized PVC does not exude or degrade at temperatures below 275⁰F.
- **“PVC is degraded by humidity.”** This is easily refuted by the fact that the pipes in our homes are PVC!

PVC Myths (CONT.)

- **“Unplasticized PVC is a blend of many chemicals.”** This is incorrect, according to Souder. Modern unplasticized PVC films for stamps are typically 98-99 percent unplasticized PVC co-polymers, with 1-2 percent thermal stabilizer added to them.
- **“Plasticized PVC films contain plasticizers that dissolve inks on stamps.”** This confuses unplasticized PVC with plasticized PVC. Note that unplasticized PVC contains no plasticizers.
- **“PVC degradation can be detected by a skunky odor.”** Sulfur containing thermal stabilizers in certain unplasticized PVC films may give off a sulfurous, skunky, rotten egg odor. These films should be avoided as they may cause damage to 19th c. stamps printed with metal based inks.
- **“PVC is a deadly poison”.** It’s approved by the FDA for direct food contact in food containers and films.

Source: APS Preservation and Care of Philatelic Materials Committee, www.stamps.org, Dr. William Souder



And Now the Bad

There have been recently published reports in German, Danish and U.K. philatelic periodicals concerning damage to stamps, particularly those of the 19th century, caused by PVC:

- “Lead Sulfide Damage to Classic Postage Stamps” by Peter Feuser, first published in Peter Feuser Auctions for SUEDPHILA in Oct. 2007 and subsequently in the German-language Bund Deutscher Philatelisten (BDPh) e.V magazine in Dec. 2007 and then translated and published in *The German Postal Specialist*, May 2008.
- “Can Plastic Films Damage My Stamps?”, Ib Krarup Rasmussen, *Dansk Filatelisk Tidsskrift*, Nov. 2008 (translation courtesy APS)
- “Stamp Conservations”, Dr. Scott Starling, *Scandinavian Contact*, Dec. 2008, The Scandinavia Philatelic Society, U.K.

From Peter Feuser's Article

Original



Original

Typical lead sulfide damage (top row 3rd and bottom row 1st from left, original shades)

From Peter Feuser's Article



Original

Typical lead sulfide damage of burelage lines

From Peter Feuser's Article



The package labels retained their original color in the area that did not come into direct contact with PVC due to the raised nature of the seal. The others have become darker due to the direct contact with the PVC film.



Why 19th Century Stamps?

Colors that are susceptible

- Orange, yellow and red shades. Since 1975, blue and green (*Feuser*)
- Orange to red contain pigments such as lead chromate (chrome yellow), lead oxide (red), mercury oxide (yellow to red) and cadmium selenide (vermillion red), lead carbonate (white lead) (*Starling*)

What Stamps May Be Susceptible?

Typical Formulas for 1869-70 stamps *(Pat Paragraphs, July 1945)*

2¢ Brown Ink

Magnesia Brown	7%	Iron Oxide
Velvet Brown	7%	Iron Oxide
Turkey Red	8%	Iron Oxide
Whiting	59%	Calcium Carbonate
Stamp Oil	5%	
Strong Oil	9%	
Patent Dryer	6%	

3¢ Green Ink

Victoria Green	57%	Chromium Oxide
Zinc White	25%	Zinc Oxide
Milora Green	4%	Iron Oxide
Patent Dryer	7%	
Stamp Oil	7%	

6¢ Red Ink

Vermilion	12%	Cadmium Selenide
Carmine	9%	Organic
Rose Lake	6%	Organic
A Lead	6%	Lead Oxide
Patent Dryer	58%	
Weak Oil	8%	
Strong Oil	2%	



Now What Do We Do?

- Test your materials to determine the type.
- First look at it. Is it clear? If yes, than it cannot be PE.
- Next, put a flame to a sample (in ventilated area). When the flame is removed, PS, PET and PP will continue to burn. PS will give off copious amounts of smoke with small black particles floating upwards. PP will smell like a burning candle or wax. PVC will self-extinguish, and the flame will go out.



Then What?

- Don't forget, PVC has been used for many years without any serious problems. It appears that the current reports may be due to bad PVC formulations in combinations with stamps printed with certain mineral-based inks.
- Dr. Souder, with many years of experience with PVC formulations, opines in private correspondence that mercaptoester stabilizers are probably at fault. Organo-sulfur stabilized PVC compounds will stink like rotten eggs. Some form of sulfuric odor always accompanies them, whether it is excess H_2S , SO_2 , etc. These odors indicate the presence of these reactive materials that can cause damage to philatelic collectibles.
- He recalled that relatively recently he obtained a shipment of page protectors that smelled like "rotten eggs" when he opened the box, indicating the presence of a sulfurous compound. He returned the pages with a note, and they were promptly replaced with pages that had no similar odor. The replacements have caused no issues. *Let your nose lead you.*
- If you wish to replace your PVC materials, then the choices are polyester (high costs), polystyrene (shrinks at higher temperatures) or polypropylene (only moderately stiff).



Lighthouse's Position

From their website at

http://www.leuchtturm.com/WebRoot/Store/Shops/leuchtturm_eu/PDF/produktinformation_en.pdf (this information could not be found on the <http://ighthouse.us/> website)

- There is much discussion in the specialist world at the moment on the subject of whether storing stamps (particularly classic stamps produced before 1875) in durable rigid PVC sheets can lead to the stamps becoming damaged by the formation of lead sulphide.
- Nobody has been able to prove a causal link between the two so far. LIGHTHOUSE has been producing stamp accessory articles from plastic for decades. Despite millions of uses, we do not know of a single case of stamp discolouration or damage related to the plastic sheets that we produce.
- Even so, we are unable to give a 100% no-risk guarantee. We therefore recommend that stamp collectors who wish to avoid any possible risk related to using rigid PVC products switch to non PVC products.
- Further, we would like to point out that apart from the storage system used, there are many other factors which can cause an alteration in stamps, documents or postmarks, including temperature, air humidity, exposure to light, airborne pollutants, lack of ventilation etc.
- We recommend that collectors inspect their collection regularly in all cases to check for possible alteration in colour or otherwise.



Suppliers of Non-PVC Products

- **Lighthouse** (various, depending on the product)
- **Kristal Kare** (various)
- **Hawid, SAFE, Scott, Blue Rose** — polystyrene
- **Lindner, Supersafe** — polypropylene
- **Hagner, Atlantic Protective Pouches** (successor to Taylor Made) — polyester

(Mylar D is no longer being manufactured. However, Melinex type 516, Melinex type 456, and SKC type SH72S are all equivalents and are suggested by the Library of Congress)