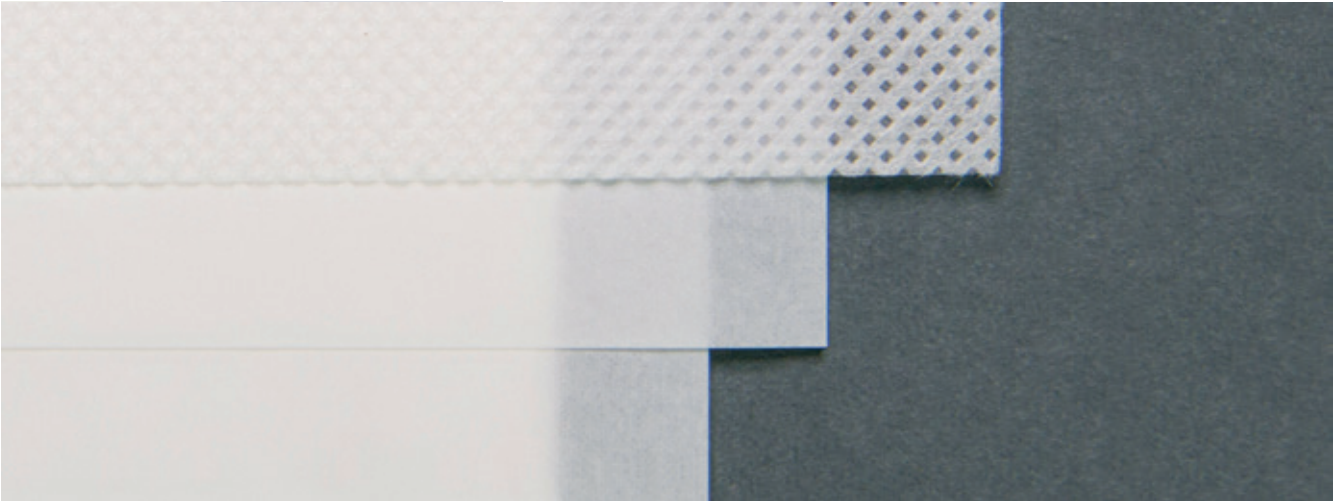


Albertina Poultice



Ready-for-use
enzyme poultice
for the removal of
starch-based adhesives



Starch-based adhesive bondings

Principle and application of the enzyme poultice

Starch-based adhesive

For over hundreds of years starch paste has been an important adhesive material used for mounting paper materials. In the inventories of graphic collections, archives and libraries one finds large quantities of objects either glued or mounted with starch paste. Starch paste, in particular wheat starch paste, is well-known for its remarkably high adhesive strength and permanent elasticity.

A further advantageous property of the starch paste is its easy removability, which can be still achieved after centuries of natural ageing, by simply using aqueous material to swell the adhesive paste. This method is sometimes also required for the removal or detachment of collection objects from books and from board material acting as release carriers.

Modified starch-based adhesive

During the 19th century several graphic art collections started to modify the use of starch paste adhesives by using further additives such as alum (calcium aluminium sulfate) and protein glue (animal) to achieve better durability. Due to the addition of these additives the paste hardens during the process of ageing and the ability to swell in water gets reduced. The modified starch paste become brittle and is inflexible towards changes in relative humidity. These adhesive properties cause for tension on the mounted originals resulting in distortions, strong folds, torn edges and creases. (see pictures on page 3)

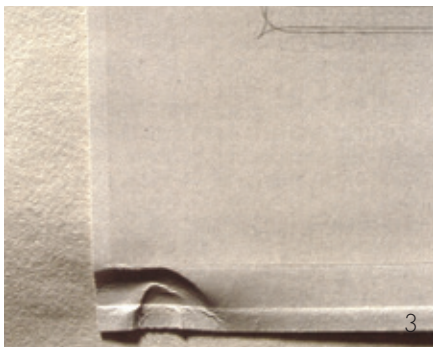
Enzymatic decomposition

The traditional mechanical methods used to liquefy or remove the starch did not prove satisfactory. This special enzyme recipe facilitates the removal and detachment of hardened starch paste – especially in the case of large scale conservation projects – in an economical, quick and very gentle manner.

Enzymes are highly complex protein molecules which can only be produced by living cells. Their main function is to accelerate – act as catalysts – specific bio-chemical reactions. In the case of amylase, which is used in this case, the strength of the starch glue paste gets reduced resulting in gentle detachment without fibre losses.

Pictures showing damage

Possible damages due to the implementation of starch-based adhesives



Pictures showing the damage in the Graphic Collection "Albertina" in Vienna, Austria:

In the Vienna Graphic Collection "Albertina", a collection of 19th century prints, mainly engravings and lithographs are stored in albums.

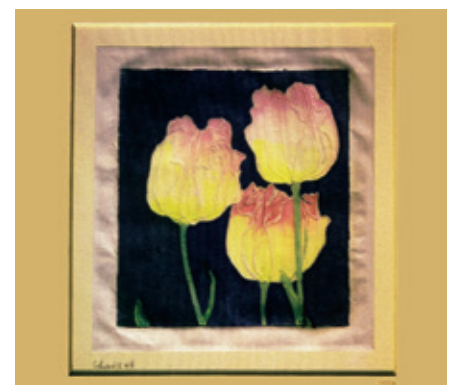
More than 200 such albums have been effected. Pictures 1– 4 illustrate typical damages caused during ageing:

- Distortions (1, 2)
- Folds and creases (3)
- Tears and torn edges due to inflexible adhesive attachments (4).

Another very common mounting method is glue the piece of art or graphic sheet on to mounting board (passepartout) by using four mounting strips with modified glue paste attached on all four edges. The picture on the right shows the damage caused using this type of mounting method on Japanese paper artwork.

Similar problems with glue hardening and embrittlement were also noticed in archival collections of autographs, where the pages were folded and mounted together at several points by starch paste and bound into a book format by sewing.

Picture: Distortion of an intaglio print tensioned by mounting strips attached along all four edges.
Arthur Illies, Three tulip blossoms, 1927, colour zinc etching on Japanese paper.



Albertina poultice

A ready-for-use enzyme poultice for the removal of starch-based adhesives

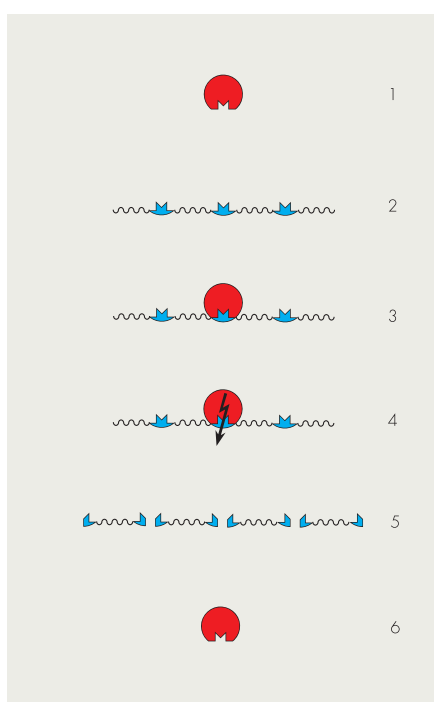
Enzyme poultice

In the field of book and graphic conservation an enzyme gel was developed, permitting local detachment and removal of starch adhesive pastes (glue), under moisture-free conditions and with no fibre losses. For the requirements of conservation and restoration workshops a ready-for-use enzyme gel with longer durability was needed. The solution for all these problems was found by using inert synthetic fleece material which is initially soaked in the enzyme gel and then dried. In the dried enzyme poultice the enzymes were bound in a stable form, and with the addition of water, could immediately be activated before use.

Functions of the enzyme gel

- Undisturbed migration of the enzyme through the paper to the layer of glue.
- Controlled moistening enables the enzymatic reaction and permits – after sufficient reaction time – detachment of the mounted items without losses and water stains.
- Minimal contamination of treated objects with enzyme gel – no residues left.

The enzyme poultice and its application have been tested extensively. The long-term effects on the tested papers have been studied by using means of artificial ageing. It could be proved that the contamination of the paper with residual enzymes and additives was negligibly small.



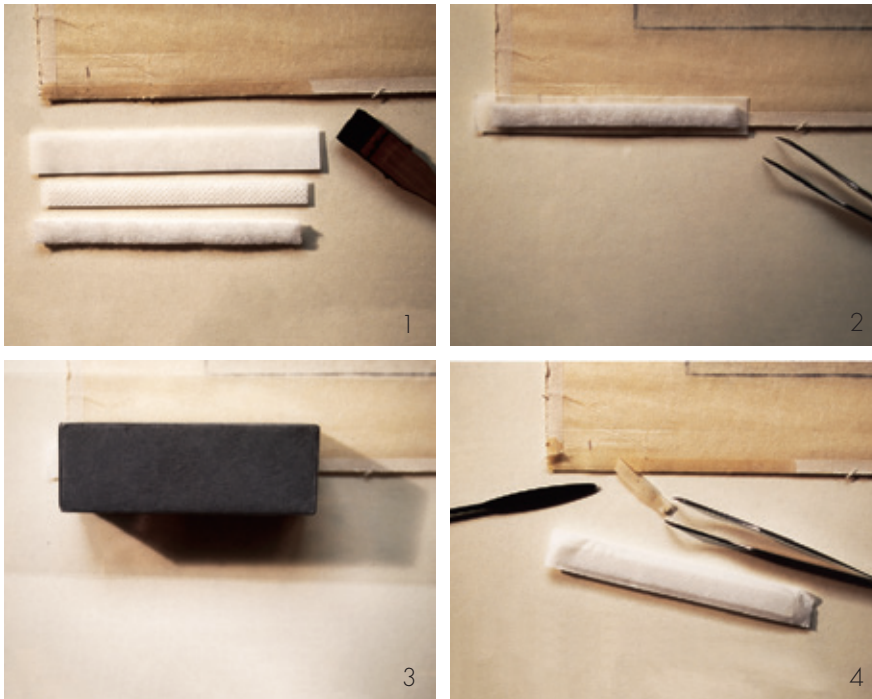
Enzymatic decomposition of starch

The enzyme (1) attaches itself, like in the key-hole principle, to a chemical bond – in this case an α -glucosidic bond (2) – and then builds an starch-based enzyme complex (3). The bonds in the starch molecule get split (4) to form water-soluble substrates (5). The enzyme molecule is then prepared for depolymerization (6) – further enzymatic splitting reactions.

- Enzyme molecule (1)
- Starch chain molecule (2)
- Enzyme starch complex (3)
- Reaction (4)
- Split product of starch, water-soluble (5)
- Enzyme molecule ready for further chemical reactions (6)

Method of use and application technique

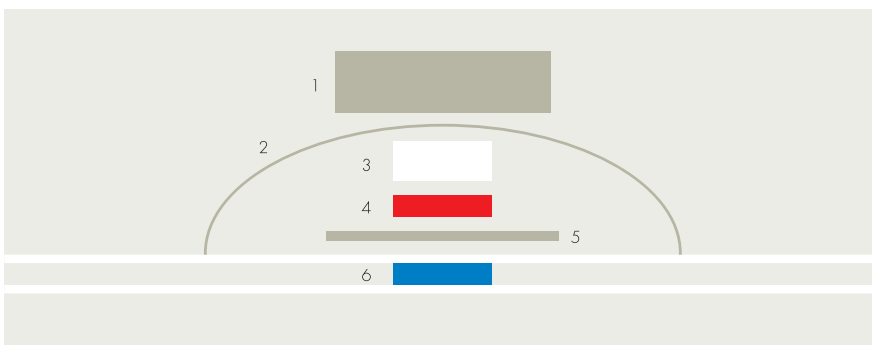
The enzyme poultice in use



Method of use (workflow)

The application method of the enzyme poultice is very simple as illustrated in the pictures 1 – 4.

- Moistening process of poultice material
Interleaving tissue paper (on top), enzyme-soaked amylose poultice (middle), blotting board – suitable moistening material (below)
- Application of the enzyme poultice
- Treatment of enzyme poultice under moderate weight conditions
- Detachment and removal of adhesive residues



Application technique

- Weight (1)
- Water-proof polyester film (mylar) (2)
- Blotting board – moistening material (3)
- Soaked amylose poultice (4)
- Interleaving tissue paper (5)
- Paper with adhesive (6)

Albertina Poullice

Practice and research

Fields of application and research development

The use of enzyme poultices for the detachment and removal of non-swellable starch adhesives from various objects has proved very successful in the cases of the Graphic Collection Albertina in Vienna, the Hamburg Art Hall Kupferstichkabinett, the Dresden National Art Collection Kupferstichkabinett, the Goethe and Schiller Archives of the Stiftung Weimarer Classic as well as for the Institute for Paper Restoration, Schloss Schoenbrunn in Vienna. This newly developed method permits a quick, moisture and residual-free removal of starch adhesives from damaged artefacts found in graphic collections, archives and libraries.

The Albertina Poullice is a development of the Restoration and Conservation departments for Graphics, in the archive and library of the "Staatlichen Academy der Bildenden Künste", Stuttgart together with the Restoration department of the Graphic Collection Albertina, Vienna. The project has been promoted by the following companies and foundations:

Supporting partners

- Forschungsförderungsfonds für die Gewerbliche Wirtschaft, Vienna
- Henkel Central Eastern Europe, Vienna
- Henkel KGaA, Düsseldorf
- KLUG-CONSERVATION, Immenstadt.

Cooperation partners

- Institut für Papierrestaurierung, Schloß Schönbrunn, Vienna
- Institut für Textilchemie, ITC Düsseldorf
- Kupferstichkabinett der Hamburger Kunsthalle, Hamburg
- Stiftung Weimarer Klassik, Weimar.

Bibliography: Blüher, A.; Banik, G.; Maurer K.-H.; Thobois, E. The application of enzyme containing methyl-cellulose gels for removal of starch based adhesives in albums. ICOM Committee for Conservation, 11th Triennial Meeting, Edinburgh, preprints, London, James & James (1996): 494 – 499.

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