2 nkor

Salt Lake, UT

ADHESIVES VOCABULARY

BOND — the union of materials by adhesives; to unite materials by means of an adhesive

CARRIER — the support material for the adhesive in all kinds of tape; the topmost layer, often of paper, cloth or polyester.

CELLULOSE ETHERS
different configurations of the cellulose molecule that have varying properties (molecular weight, viscosity, etc). In conservation they are used as additives because of their limited adhesive strength to provide slip, longer working time, flexibility and reversibility. (see methyl cellulose, ethulose)

COATING, COATED
paper or board which has had its surface modified by the application of a material which changes its finish; usually clay or pigments or adhesives which make the surface more receptive to printing, painting or drawing media. Coated papers are generally smoother but can be matte or shiny in appearance

CREEP — a change in the dimensions of a material which takes place over time, when the material is under constant load; at room temperature creep is often referred to as 'cold flow', seen as the tendency for the adhesive on pressure-sensitive tapes to ooze out from the edges of the carrier

CROSS-LINKING: a chemical change between molecular chains; a change that alters the original properties of a material and changes its solubility.

EMULSIONS — a system consisting of a solid dispersed in an immiscible (incapable of mixing) liquid, usually in the form of droplets. A suspension, a substance whose particles are mixed into but not dissolved in a liquid

ETHULOSE — a water-soluble, nonionic cellulose ether, similar to methyl cellulose; comes as a powder, dissolves in water or alcohol, and dries to a thin, flexible film. Can be used as a surface consolidant, not an adhesive

FILLERS — materials added to compounds to increase viscosity or gravity, to add color and to extend the volume

GELATIN — a complex protein used as a size, a glaze and a low-strength adhesive or consolidant; made by boiling hides and bones (particularly those of bovines) with dilute acids. Gelatin swells in cold water but is insoluble in it; it dissolves in hot water to produce a viscous, jelly-like material

GLUES (natural) hide and bone glues are obtained from animal materials and have a complex protein structure. Hide glue has a fairly neutral pH in solution, while bone glue is generally acidic. Animal glues have the ability to pass from a liquid to a jelled state upon cooling, and then revert to the liquid state upon reheating

HIDE GLUE — an animal-base adhesive, made by boiling out the collagen constituents of animal hides and hoofs. It is generally water-thinned and applied hot. A traditional sizing for canvas and an adhesive used in bookbinding, it forms a tough, flexible film upon drying, but is slightly acidic and will darken with age; therefore it will discolor paper and board over time. Can be softened (swelled) with warm water for removal.

METHYL CELLULOSE a synthetic cellulose-based sizing/low-strength adhesive which is soluble in water. It is useful for small tacking or hinging jobs; can also be added to paste to make it more slippery. Comes in granular form to be dissolved in water; dries to a clear film which is reversible with moisture

PLASTICIZE to soften a material and make it flexible or moldable, by the addition of a plasticizer or the application of heat

PLASTICIZER a material incorporated into a resin formulation to increase its flexibility; plasticizers are usually liquids or soft solids at room temperature which, when added to an adhesive, make it softer and more comformable to the surface to which the adhesive is applied (examples: glycerin, sorbitol, triethylene glycol)

POLYVINYL ALCOHOL RESINS (PVOH)
a type of resin obtained from the addition of methanol to polyvinyl acetate; a polymer with good light stability, good strength and flexibility. Soluble in water, but not hydrocarbon solvents

PVA used to refer to poly vinyl acetate emulsions, but are more accurately named PVAC, or poly (vinyl acetate). Pvacs or 'white glues' are synthetic adhesives; they range greatly in viscosity, molecular weight, rate of drying, degree of tack and amount of flexibility upon drying. They also can have differing light stability & aging characteristics. Most dry to a clear film. PVACs can be incorporated into water-based adhesives, such as paste and methyl cellulose

STARCH PASTE in conservation both rice and wheat starches are used as adhesives. Starch pastes come as pure, highly refined flours that must be mixed with water and cooked. Excellent for paper-to-paper and paper-to-board adhesion, and for leather in bookbinding. Paste forms a transparent film that produces a strong bond which is reversible in water; pasted materials must be dried under weight or shrinkage will occur (because of evaporation of water). Provides longer working time than either PVA resins or hide glue as it does not "set up" as quickly.

SYNTHETIC produced artificially, man-made, fabricated

PRESSURE-SENSITIVE a material which remains tacky for a long time and which will adhere immediately to most solid surfaces with the application of very slight pressure Examples are Scotch™, masking, Magic mending. etc.; none are considered archival

RESINS can be natural or synthetic; the natural resins are principally of plant origin, the most common being Arabic (from sap and pods of the acacia tree), Damar and copal. The natural resins can be translucent to transparent, and are insoluble in water but soluble in organic solvents. They are frequently used in the manufacture of printing inks and varnishes

SHELF LIFE a term used to describe the time a material can be stored without losing any of its original physical properties

SOLVENT usually, a liquid substance capable of dissolving or dispersing one or more other substances; something that provides a solution (a liquid containing a dissolved substance)

VISCOSITY a measure of the resistance of a fluid to flow

PAPER VOCABULARY

ABACA — the name of a plant commonly known as manila hemp, related to the banana; produces a strong, buff-colored paper.

ACID FREE — the term 'acid-free' is used to describe papers which have a pH value of 7.0 or greater; they can be manufactured from a variety of fibers, with water free of metallic impurities and free acid. By itself, the term 'neutral pH' can refer to papers which have arrived at that state by being chemically refined.

ALUM — a salt (aluminum sulfate) used in the manufacture of paper and the processing of leather skins. In papermaking it helps retain other additives, such as sizing, in the paper; however, it is acidic when dissolved in water and therefore a detrimental component.

ARCHIVAL — having the properties of a material that ages well. Although it is a generic term, archival materials should have a pH of at least 7.0 and as added protection, the inclusion of a chemical buffer. In the strictest sense, no paper can be truly archival if it contains alum, artificial brighteners (bleaching agents), impure water (containing iron oxides and other pollutants), and alkaline dyes (which are fugitive and usually use alum as a fixative). Archival papers do not necessarily have to be 100% rag although a rag fiber produces a stronger, more resilient sheet which wood pulp papers can never match.

BUFFERED — refers to papers and boards which have added to them an alkaline substance (ex. calcium carbonate or magnesium bicarbonate) which renders them alkaline on a pH scale; they are designed to neutralize acids that are present and to better withstand an acidic environment.

CALENDERING — a process for imparting a smooth, sometimes glossy finish to paper, achieved by passing it through a series of metal rollers.

CHAIN LINES — the widely spaced lines in paper made in a laid mold; the lines are created by the impression in the pulp of very thin wires which are used to sew the more numerous, closely spaced laid wires to the mold.

CHINA PAPER — an extremely smooth opaque paper achieved by the addition of kaolin, a fine clay, to the pulp before sheet formation; the clay acts as a filler in the interstices of the fibers.

CHINE COLLÉE — a paper collage process in which two sheets of paper are laminated together by the pressure of the etching press and sometimes a small amount of adhesive. Adhering the finer sheet to a more substantial one allows the etcher to use a smoother, more delicate surface for his image which would not normally withstand the pressure of the intaglio process.

COLD PRESS — the surface quality of a sheet that has been dried in the normal manner and not treated further (pressed, calendered, or glazed).

DECKLE EDGE the uneven, feathered edge caused by the deckle frame in the production of handmade paper.

DEXTRIN a material made from wheat starch and used as an adhesive, a paint binder and a stiffener (in textile manufacture). Comes as a pure white powder that is soluble in water; familiar as the adhesive on envelopes and postage stamps.

FASTNESS the quality found in colored papers and textiles which withstands the effects of light, acids, and alkalis.

FUGITIVE a term applied to pigments that are not light-fast, i.e. fade easily sunlight

GELATIN a colorless protein obtained from animal tissue and added to paper to make more resistant to water so that it will resist staining or bleeding in the printing or coloring process.

GLAZED PAPERS papers which have been placed between polished zinc plates and run through steel rollers to impart a smooth, polished surface.

GLUE 1) Natural: an adhesive derived from animal materials (bones or hides); glue adhesives have a complex protein structure, are soluble in water, and change in consistency upon cooling (liquid when heated, a gel upon cooling, and a hard stiff surface upon drying).

2) Synthetic: a group of resin adhesives that are produced by emulsion polymerization; most white glues are synthetic; they harden into a somewhat flexible but irreversible adhesive.

GRAIN the alignment of fibers in a sheet of paper; the direction in which the majority of the fibers are oriented.

GUM ARABIC a gum from trees of the genus *Acacia*, available in lump or powder form (more formally known as gum acacia). Used as an adhesive, thickener, and as a binder in watercolors and tempera (as well as in the ceramics, confectionery, & pharmaceuticals industry). Gum arabic is soluble in hot water (common mucilage is cooked gum arabic). It is slightly acidic, reversible in water, and dries to a shiny film.

HEMP an Asian plant with fibers of high cellulose content, suitable for making paper; hemp produces thin, opaque papers of great strength.

HOT PRESSED refers to the smooth surface of a sheet made by passing sheets of paper through hot metal plates or rollers, resulting in a smoother surface than regular calendaring.

JAPAN PAPER a European name for a buff-colored paper used for printing finely detailed engravings in the 17th century; does not refer to all Japanese papers.

IMPERIAL refers to the size of 22" x 30" watercolor and printing paper.

KOZO — one of the three principal plant that produces fibers for the manufacture of Japanese paper. Kozo refers to several plants of the mulberry family, whose fibers are very long and which produce a strong, dimensionally stable paper.

LAID PAPER — paper that is made on a laid mold and which retains the impression of the thin support wires which span the frame.

LINTERS — the short cotton fibers that remain on the cotton seeds after the ginning operation; when purified, they are used in the manufacture of paper.

MITSUMATA — a shrub plant cultivated in Japan for its fibers, used to make a soft, absorbent paper which is slightly peach-colored.

MOLD MADE — refers to a deckle-edge paper which looks handmade but is actually produced on a cylinder machine.

PARCHMENT — a writing or printing surface made from the split hide of sheep or goats.

PASTE — refers to a vegetable starch adhesive, usually made from wheat or rice flour; produces a strong, penetrating bond that is reversible in water.

pH — a term for expressing alkalinity and acidity in a material. pH is represented on a scale whose values run from 0 to 14, with 7 representing neutrality. Numbers less than 7 represent increasing acidity and those greater than 7 increasing alkalinity.

PRESSURE-SENSITIVE TAPES — a term referring to commercially available tapes which 'bond' with pressure; the most common are Scotch™ tapes and masking tape. They have very poor aging characteristics; they darken with age, are difficult to remove, and stain the surface to which they have been applied. Non- archival.

PVA GLUES — polyvinyl acetate resins; 'white glues'. A large group of synthetic adhesives formulated by various manufacturers, often with a plasticizer for flexibility; these are strong adhesives, forming bonds between both porous and non-porous materials. Once dry, these adhesives are non-reversible and, therefore, should not be used in direct contact with art work or items of value. They can also yellow with time and normal exposure to direct sunlight; non-archival.

RAG CONTENT — refers to the amount of cotton fibers in a paper; 100% rag means a paper made entirely from cotton; 25% means one-quarter of the fibers are of cotton. The higher the rag content the higher quality the paper.

RAG PAPER — refers to the paper made from linen or cotton rags (the original definition of the phrase). The pure cellulose materials produce an extremely strong sheet; present-day 'rag' papers are made from cotton fibers, also called 'linters'.

RAMIE — the bast fiber of the ramie plant, a tall herb of the nettle family.; the interior fibers are almost pure cellulose and are identical in composition with bleached cotton and linen. It is used in Asia as a textile fiber and in Europe for banknote paper; one of the strongest and most durable vegetable fibers.

RICE PAPER — technically refers to a non-fibrous, pith-like material cut from the inner core of the Tetrapanax papyriferum (rice paper tree); it is not manufactured but split into thin layers which when dried can be written or painted on. More commonly and incorrectly used in reference to all Japanese papers.

TOOTH — a characteristic of the surface of various papers, usually referring to the roughness of a sheet and its ability to accept drawing media.

SIZING — additives to the paper fiber, either during the beating stage (internal) or after the sheet has been dried (external or tub sized). The additives (such as glue, gelatin, or starch) control the absorption of water into the sheet and allow it to accept ink and pigments without bleeding or feathering.

VELLUM — a writing or printing surface made from unsplit calfskin; a term sometimes used interchangeably with parchment or to refer to a finer quality of parchment. It is more correct to refer to treated sheepskin as parchment and calfskin as vellum.

WATERLEAF — paper that has no sizing; it is highly absorbent and unsuitable for writing or printing.

WATERMARK — a design, letter or symbol incorporated into a piece of paper during manufacture (sheet formation); it represents a thinning of the sheet (less accumulation of fibers) and appears lighter than the rest of the surface.

WOODPULP — also referred to as groundwood pulp or mechanical wood pulp; paper manufactured from ground up wood chips; it is very short fibered and has relatively low tensile strength, discolors rapidly upon exposure to air and sunlight, and has little permanence.

WOVE PAPER — a sheet produced on a wove mold; the surface of the mold is made from a woven mesh screen, and the resulting sheet has a more even, less textured surface than a laid paper (there is no vertical and horizontal line pattern).

ZUKOR ART CONSERVATION
(510) 652-7915 tel. (510) 652-7126 fax

ADHESIVES

Adhesives can be classified in a variety of ways; by their **chemical nature** (whether they are natural or synthetic), their **physical state** (liquid, solid), the **method of application** (spray, brush, etc), or the **setting reaction** (the manner in which they 'set up' or dry). The strength of an adhesive bond and the speed with which it forms are often the most important considerations for use, but the following notes offer additional information on their other properties: how safe they are for handling, how much will they shrink, how will they age, if and how they can be removed (reversed), and what are their most appropriate applications.

NATURAL ADHESIVES

PASTES (plant base)

WHEAT PASTE or RICE STARCH PASTE: a general purpose, reversible adhesive for use on paper, board and leather. Good for paper-to-paper adhesion (collaging, hinging). Forms a transparent film that produces a strong bond which is reversible in water. Will cause warpage in board and paper because of the evaporation of water during drying and the resulting shrinkage, unless adhesion is between identical materials and is dried under weights. Provides longer working time than either PVA resins or hide glue as it does not "set up" as quickly. Can be buffered with calcium carbonate to counter slight natural acidity of paste. There are Japanese-made pastes available in a tube, but they are not recommended because of added fungicides and plasticizers. The best quality paste is made from wheat starch flour cooked until it thickens. It can be stored refrigerated for up to a week; after that, paste can develop mold and lose its adhesive quality. Recipe: mix one part flour and four parts distilled water in the top of a double boiler and stir until all lumps are gone. Let stand at least one hour (the longer it stands, the more the flour absorbs the water, shortening the cooking time). Cook over boiling water, stirring constantly, til paste thickens and begins to look more transparent and grey. Continue to cook until it is thick and stiff, still stirring. Remove from heat and continue stirring while slowly adding distilled water to desired consistency. Store in a clean glass jar with tight lid.

GLUES (animal base)

Hide and bone glues are obtained from animal materials and have a complex protein structure. Hide glue has a fairly neutral pH in solution, while bone glue is generally acidic. A glue having a high acidity absorbs less water and tends to set more slowly than a glue having low acidity. Animal glues are soluble only in water. They have the ability to pass from a liquid to a jelled state upon cooling, and then revert to the liquid state upon reheating.

HIDE GLUE: an adhesive prepared by boiling out the collagen constituents of animal hide and hoofs. It is generally water-thinned and applied hot. A traditional sizing for canvas and adhesive employed in bookbinding, it forms a tough, flexible film upon drying, but is somewhat acidic and will darken due to acidity and therefore discolor paper and board with time. Can be softened to a gel with cold water and dissolved with warm water.

GELATIN: a protein material manufactured from hides and bones (particularly those of bovines), and is made by boiling those materials with dilute acids. Gelatin swells in cold water but dissolves in hot water. It produces a highly refined glue (but a weak adhesive) and is used in the manufacture of photographic films and in the sizing of paper. When dry, gelatin is hard but flexible.

SYNTHETIC ADHESIVES

METHYL CELLULOSE: a synthetic cellulose-base sizing/adhesive which is soluble in water. It is a low-strength adhesive, not recommended where a strong bond is required, but it is useful for small tacking or hinging jobs and can be added to starch paste or PVA for use on paper. Dries into a clear film which is reversible in water; comes in granular form to be dissolved in water. Indefinite shelf life, if made up with distilled water and stored in a sterilized jar. ETHULOSE is a very similar material to methyl cellulose. It comes as a powder, dissolves in water, and dries to a thin, flexible, matte film. It can also be dissolved in alcohol (ethanol) which allows the film to dry more rapidly. It is primarily used as a surface consolidant, not an adhesive.

Synthetic Polymer Dispersions: dispersions differ from emulsions in that they are solid particles in a liquid. True emulsions are a liquid dispersed in a liquid. Synthetic resin dispersions can be used as wet adhesives or dry films activated by heat or solvents. Different resins are characterized by different melting temperatures that can be changed by mixing resins together. Solvents can be added to act as thickeners or cellulose ethers added to improve reversibility. In conservation they are mainly used to adhere secondary supports and not directly used on the artifact unless it is highly sensitive to moisture.

RHOPLEX (manufacture by Rohm & Haas Co., Philadelphia PA)

Rhoplex AC 33: aqueous acrylic dispersion based on a mixture of methyl methacrylate, ethyl methacrylate copolymer, similar to acrylic gel medium. Comes as a milky white liquid with a pH 9.7 (due to addition of ammonia?) dries as flexible water resistant film that can be reactivated with heat or solvents. Good pH and freeze/thaw stability.

Rhoplex AC 234: Similar to Rhoplex AC33 although it remains slightly tacky upon drying. Often used in mixture formulations of heat seal tissues; solvent (toluene or alcohol) or heat re-activated. Requires higher temperature for reactivating than AC33, alkaline pH of 9 to 10.

Rhoplex N 580: higher percentage of solids, pH of 8. Can be used as a pressure sensitive adhesive although the bond activated by heat or solvents is stronger. Dry mechanical reversal may be hard on paper, some evidence of cross-linking with age. Has a pH of 7.7 with good stability. Must not freeze. Similar adhesives with pressure sensitive applications are Rhoplex N619, N1031, LC67.

Lascaux Products: (manufactured by Alois K. Diethelm, Switzerland)
A series of acrylic resin dispersions that have multiple applications; they can be initially thinned with water but will not dissolve in water after drying. They are resoluble with heat or solvents (acetone, toluene or xylene) and can be used as a contact adhesive or be heat-activated after drying. They work well on paper-to-paper and paper-to-fabric adhesion and are excellent in applications where introducing moisture would be undesirable, or where varied materials are being attached to one another.

Lascaux 360 HVA: forms a very elastic film that can be used as a contact adhesive (will hold by pressing into place) or form a stronger bond with the application of heat. If not heat set, it will remain tacky.

Lascaux 498 HV: somewhat harder and not as tacky as Lascaux 360 HV; has the smooth consistency of mayonnaise, sets up (dries) very quickly, and forms an excellent bond without warpage (cockling). Should be weighted immediately after application, to insure contact.

PVA EMULSIONS (white glues): polyvinyl acetate resins.
Synthetic adhesives formulated by various manufacturers with a plasticizer to retain flexibility; these are strong adhesives, forming bonds between both porous and non-porous materials. The most familiar brand is Elmer's. Once dry, these adhesives are non-reversible and, therefore, should not be used in direct contact with the art or support. They can also yellow with time and exposure to direct sunlight. If an adhesive which contains no water is required, there are now better quality PVA glues that have excellent light stability and aging characteristics (CE Bond M-4, Rhoplex 580). They contain no plasticizers and dry to a clear film; at least one available product is reversible in water (available from *Bookmakers*, Riverdale, MD. 301-459-3384).

Polyvinyl Acetates: AYAA, AYAC, AYAF, AYAT
These resins are designated by their molecular weight (viscosity); the tensile strength increases with the degree of viscosity. While they have good initial flexibility, great bonding strength and a short set-up time, they are soluble only in acetone or toluene and usually cannot be completely reversed. They adhere to both porous and non-porous materials and can be heat-sealed.

Polyvinyl Acetates
The following adhesives can be used in a variety of applications and can be mixed with starch pastes as well. They are not strictly archival because they are not reversible but are high quality, form strong bonds and age well. We have used them extensively in paper-to-paper adhesion, paper to linen, and paper to board. They can be thinned out with water or methyl cellulosefor easier application, but with a higher water content , the adhered materials will be subject to more warpage on drying. M-1, -2, and -3 are all fairly similar homopolymers with slightly different viscosities and molecular weights; they are available from *Conservator's Emporium* (702-852-3737)

> **M-1 Bond:** fast drying, high molecular weight polymer emulsion containing no plasticizers. provides excellent adhesion and dries to a clear film; pH of 5. - 7.
>
> **M-2 and M-3 Bond:** also contain no plasticizers and dry to a clear film. M-2 has a pH of 4.5 - 6.. M-3 is mostly used on china and porcelain; it has a pH of 5. - 7.
>
> **M-4 Bond:** more flexible than most PVA adhesives; somewhat resistant to fungus and mold, but contains ethylene. It is heat activated and dries to a high gloss film that it more flexible and less brittle than other PVA adhesives. It softens at a lower temperature and is resoluble in methyl alcohol. Has a pH of 2. (so not archival!).

BEVA 371 (manufactured by Conservator's Products Co., Chatham NJ)
A heat-activated adhesive consisting mainly of ethylene-vinyl acetate copolymers, dissolved in a mixture of toluene and n-heptane (all nasty). BEVA will adhere to virtually any surface including polyester film (such as Mylar) but it does not stick to silicone or teflon coatings. Comes in a can in a gel-like form; can be liquified by heating and set by heat (approx. 65° C.) Can be diluted with naphtha or hexane. It can be applied to a surface by brush or roller, or sprayed on at high pressure to form a 'flocked' layer that when allowed to dry can be reactivated with heat (145° F./ 63° C) or with solvents. This reduces the risk of staining because the solvent evaporates before the spray hits the object. If applied with a brush, the solvent carries the adhesive into the paper and can produce a translucence like that of a grease stain. Because it is formulated with chemicals, it is recommended that BEVA 371 Film be used in its place.

BEVA 371 Film
Comes as a film sandwiched between two sheets of release mylar; it is transparent, solvent free, non-toxic and non-staining. and is activated by heat (such as with a tacking iron or hot air gun). It can be cut into any shape and inserted between layers of materials such as in collage, or used with Japanese paper or unbleached linen for hinge attachments. Can be removed with hexane or acetone. Comes on a roll 27" wide; expensive.

BEVA 371 Spray
The same adhesive as the solution but in a spray can .
All BEVA products available from:
Conservation Support Systems (800-482-6299)

NOT RECOMMENDED

SPRAY ADHESIVES: commercially available spray adhesives (such as Krylon™, Blair etc.) have not been formulated to age well; they yellow with time, can lose their adhesive properties, harden and badly stain paper. Some spray adhesives are removable in solvents, but the paper and media would also have to withstand the solvent treatment.

PRESSURE-SENSITIVE ADHESIVES: describes an adhesive which will stick to a surface by means of applied pressure (usually manual). These adhesives are made from a wide range of natural rubbers and synthetic polymers. They contain tackifying resins and plasticizers (which tend to migrate and or volatilize over time), pigment fillers (which color the adhesive or mask the tendency to yellow on aging) etc., all of which affect adhesive and aging properties. These adhesives are those found on commonly used adhesive tapes, including Masking tapes, Artists' Tape (3M Co.), Magic Mending Tape, Scotch Brand Transparent Film Tape, Double-sided tapes, and Post-It Note Pads. They are to be avoided, because when they age, these adhesives not only discolor significantly but degrade the paper to which they are adhered.

Also Not Recommended:
Elmer's glue
Wilhold woodworking glue
YES Paste (reversible in water, but yellows quickly & stains adjacent materials)
Duco cement
Rubber cement
Titebond wood glue
Filmoplast™ (fine for matting but not for direct contact with artwork)
all pressure-sensitive tapes (masking, Magic Mending, all 3M tapes)
epoxy adhesives

SYNTHETIC ADHESIVES

CELLULOSE ETHERS: A group of adhesives which are used both by themselves and i conjunction with other pastes and glues. In conservation they are uses as additives because of their limited adhesive strength, flexibility, smoothness, and clarity on drying. They are available in various viscosities which affect the degree of penetration and whether they dry glossy or matte.

METHYL CELLULOSE: a synthetic cellulose-base sizing/adhesive which is soluble in water. It is a low-strength adhesive, not recommended where a strong bond is required, but it is useful for small tacking or hinging jobs and can be added to starch paste for use on paper. Because its gel structure holds moisture within itself more than paste, it is preferable to paste when a "non-wet" adhesive is desired. It sets up slowly and dries into a clear film which is reversible in water. MC comes in granular form., and has an indefinite shelf life, if made up with distilled water and stored in a sterilized jar. Frequently used in bookbinding in conjunction with PVA glues, because it makes the fast-drying glue set up less quicklyand makes it more smooth and slippery (so it spreads more easily). A mixture of about 3 parts PVA to 1 part MC, depending on the viscosity of the PVA, is fairly standard.

ETHULOSE is a very similar material to methyl cellulose. It comes as a powder and dissolves in water or ethanol (the water/alcohol solutions dry more rapidly and cause less staining than pure water solutions). It dries to a thin, flexible, matte film and is primarily used as a surface consolidant, not an adhesive.

SODIUMCARBOXYMETHYLCELLULOSE (CMC) is a stronger adhesive, but still has a long shelf life and is even "dryer" than methycel. A good combination adhesive is a mixture of CMC and paste; 2 parts CMC and one part starch paste. It has good strength and excellent shelf life.

ADHESIVES RECIPES

Wheat Starch paste (Zin Shofu, Belgian rice starch, wheat paste)
4 parts distilled water
1 part wheat or rice starch flour
(always use a 4:1 ratio of water to flour by volume)

Stir flour into distilled water and allow to stand overnight, if possible, or several hours. Cook over medium high heat, in the top portion of a double boiler (preferably nonmetal) stirring constantly, until paste turns translucent. Turn heat down, but keep at low simmer, stirring, for another 30 minutes. Adhesive should become stiff and slightly grey in color. Remove from heat and cool, stirring occasionally, covered, to avoid a 'skin' from forming (a damp paper towel will do). Strain through a non-metallic strainer into a clean jar; paste will cool to a gel. When needed for use, thin with distilled water. Otherwise, keep paste tightly covered in refrigerator or cool, dark place. If lumps form, the paste can be strained through a fine mesh strainer. It can also be placed in a blender, but this introduces more air into the paste that may contain bacteria; it may cause the paste to breakdown more quickly. We tend to only strain the amount of paste used in a day and leave the remainder in the jar until needed. Refrigerated paste lasts about one week before losing its tack and/or starting to spoil.

Quicky microwave method:
Using same 4:1 ratio of distilled water to flour, mix slurry together well, and place in clean glass container twice the depth of the mixture. Place in microwave and cook at half power for 10 seconds; stir, cook for 10 more seconds, and stir again. The mixture should be thick and slightly grey in color, so continue cooking on low power for short periods and then stir. Total cooking time is a couple of minutes. Let paste cool, and then use. It can be thinned down if necessary, with distilled water.

Methyl Cellulose
Warm 100 ml. distilled water to 80-90 C (176-194 F). Put in blender and slowly add 9.375 grams methyl cellulose (Dow A15C). Blend at low speed for 30 seconds. Always add the powder to the water, stirring constantly. Pour from blender into storage container and add 275 ml. additional water which has been chilled. Mixture will be full of tiny air bubbles at this point, so it will need to 'settle' out, preferably overnight. Cover and chill. Methyl cellulose can be made up in a greater concentration to produce a more viscous gel, and it can be thinned with water, preferably distilled. If the water is distilled, and the storage container very clean (sterilized), methyl cel should last indefinitely. Remember to always take out the desired amount of adhesive from the jar with a clean utensil to place in a smaller dish; avoid contamination by not dipping your brush into the original container.