

# SCIENCE

## of Scrapbooking



### WHAT ARE THEY TALKING ABOUT?

#### Ways to Describe Adhesives and Tapes

by Joseph Callahan

**YOU ARE ABOUT TO LEARN MORE ABOUT ADHESIVES AND STICKING THINGS TOGETHER THAN YOU EVER WANTED TO KNOW. AS A CHEMIST, I HAVE BEEN WORKING ON MAKING THINGS STICKY FOR THE LAST SEVENTEEN YEARS AND LEARNING WAYS TO DESCRIBE WHAT MAKES THEM STICK.**

THE FIRST PROBLEM IS, UNLESS I AM TALKING TO ANOTHER CHEMIST, NO ONE SEEMS TO UNDERSTAND ME. THE SECOND PROBLEM arises when someone tries to read the back of the product boxes. What are those manufacturers talking about? The terms used by manufacturers are meant to help you understand what makes their product unique and what the product can be used for, but it just all seems like a foreign language.

Adhesives, glues, pastes, and tapes have been used for years to bond two items together. You find them on art, historical documents, holding your heirloom furniture together, and just about everywhere you can imagine. Lets start right off by describing what the difference is between these materials.

**ADHESIVE** is used to describe the wide range of substances that have the ability to bond two items together by some form of chemical or physical interaction with the surfaces. Adhesives can be solid or liquid and may require some type of activation to make them stick. Many solid adhesives use either pressure or heat to make them stick. Hot melt adhesives are applied by melting, and transfer adhesives are applied by rubbing. These are examples of solid adhesives that bond to surfaces by being sticky when they are applied. Some liquid adhesives will chemically bond to a surface, such as two part

epoxies, while others will be absorbed into the material being bonded.

**GLUES** are adhesives of a particular type. They are made from the proteins found in things like bone, milk, animal hides, tendons, and other sources. Most common glues are made with water and require drying to complete the bond.

**PASTES** are commonly made from starch, starch gum (dextrin), or latex and may have glue or other materials added to give better properties. Usually they are made with water and require drying to complete the bond. Paste

is often used to describe the consistency of a material rather than any particular chemistry.

**TAPE** is nothing more than adhesives that have been dried onto a carrier. A tape is a paper, plastic film, metal foil, or cloth that is coated with a dry adhesive that is activated by heat, pressure, or moisture. An example of a heat-activated tape is iron-on hemming tape used in sewing. Pressure activated tapes are those that are always sticky to the touch and include box-sealing tape, duct tape, and office tapes to name a few. Some box-sealing tapes can require wetting to complete the job.

Now that we are all thinking sticky, let's look at some of the ways manufacturers and chemists describe all of these materials. One of the terms used heavily is "acid-free." Its importance comes from the paper industry where it was discovered that acid in the paper decreased the life-span of the paper. High-acid papers, such as those used for newspapers, age faster than pH neutral or buffered papers, and become brittle and brown. Because of its use for papers, "acid-free" has come to mean a material will last longer. This is not necessarily the case with other materials, but because the term is so widely used by customers, many manufacturers have begun making their adhesives and tapes acid-free. Acid-free simply means that the material contains no acid. Some believe that all acid-free materials are photo safe and longer lasting, but this is not the case. For a material to be photo safe it must be tested against photo papers and negatives to determine if the material reacts to the coatings on the surface of the photo. Liquid drain opener is acid-free, but I would not put it on my family photos.

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**BLEED THROUGH** is when an adhesive flows through the item it has been applied to. This doesn't only happen with liquids, but also with solid adhesives. Because many items are porous or made of fibers, they contain many small holes. Liquid adhesives can flow through these openings and end up on the opposite side of your item, causing it to stick where you didn't want it. This can also happen with solid adhesives because of cold flow, when the adhesive slowly flows through the item. A good example is when an adhesive has flowed into the fibers of a piece of paper and caused it to look translucent or tissue-like because the clear material has filled in the voids.

**COLD FLOW** is the property of a material to flow under room temperatures. For example, even though glass seems solid it is flowing over time. That is why you will find that the bottom of a pane of glass that has been in a window a long period of time is actually thicker than the top. The glass has flowed down to the bottom of the window. This can also happen with adhesives and tapes. The result of adhesive cold flow is that the sticky adhesive can ooze out from below the edges of the film backing of the tape or from under the item and cause pages or items to stick together. Solid adhesives that are very sticky are usually also very soft, meaning that they are continually flowing, giving them a high cold flows.

**INERT** is a word used to describe the degree to which a material will not react chemically to other materials around it. This is especially important when you consider the wide range of chemistries in papers, inks, and the environment. If something is totally inert, it will not chemically react with anything around it. Normally, a manufacturer will indicate what a material is inert to. If the packaging says the product has good solvent resistance or that it is not affected by light, they are describing how inert the material is.

**OUTGASSING** is what the material gives off as vapor into its environment under both normal and extreme conditions. Low outgassing is critical for enclosed environments such as those being utilized in preservation, framing, and memory books. Fumes coming off of the material contribute to the surrounding environment and can be trapped, causing the stored items to react chemically. Any odors coming from a tape or adhesive means something is being released into the environment. If you can smell it, then something is outgassing. If you use liquid adhesives, make sure they are completely dry before closing or sealing the page or project.



**PERMEABILITY** is the ability of the tape or adhesive to keep vapors and liquids from passing through to the other side. This becomes important when you think about sealing a framed picture or memory page to protect it from the environment. Many tapes and adhesives sold are designed for this sole purpose.

**pH** indicates the amount of acid or base ions that are present in a material and is measured on a scale from 0-14. Pure water has a pH of seven and is considered neither acidic nor basic; it is neutral. If a material has a pH above seven, it is considered basic. An example of a strong base would be drain cleaners with a pH above 11. If a material has a pH below seven, it is considered acidic. An example is the acid in your car battery. Paper and other materials are susceptible to acid/base reactions. The further the pH level is from the neutral point of seven the more problems it can cause by reacting chemically. Remember, acids and bases require liquid to be mobile, so the humidity of the storage area is also important. The more humid the storage area, the more mobile the acid and base ions are. This can allow them to react with other items.

**PHOTO SAFE** is a way of describing a tape or adhesive that will not harm photographs. This seems simple enough, but we often don't think to look for this on a package. If a manufacturer puts "photo safe" on their package, they are indicating that the material has been tested on the wide range of photo materials in the market today.

The more you know, the easier it will be to select the right adhesive or tape to do the job.

**REVERSIBILITY** is being able to take the items adhered apart again. This simple concept can be the most difficult to accomplish. Many tapes and adhesives are described as being permanent or removable, both of which are a measure of reversibility. Some tapes and adhesives are reversible by using some form of solvent, but the solvent may attack the article. Another method sometimes employed is the application of heat or cold. Controlling the bond strength can be used so that the bond is weaker than the materials the adhesive is applied to, allowing them to be pulled apart. With the wide range of chemistries being used in today's arts and crafts, the only way to be sure the bond is going to be reversible is to use the manufacturer's directions. If the adhesive is water-reversible, then only use it on articles that are not going to be damaged by water. If an adhesive is heat-reversible, then make sure your article can handle heat.

**THERMAL STABILITY** describes how a material will react when exposed to temperatures other than normal room temperature. Under elevated temperatures, adhesives may breakdown, shrink, flow, or out-gas. This can cause staining, tacky edges, bleed through, or reactions with whatever the adhesive has been applied to. The reverse is also true. Some adhesives will become brittle or lose their stickiness when they become cold, allowing the adhered articles to fall apart. The more thermally stable the material, the better.

**UV STABILITY** is the ability of a material to be stable under light. Because your project may be displayed under light, UV stability is critical to preventing chemical reactions resulting in discoloration or brittleness. We have all seen what can happen to materials as a result of sun exposure. Fabrics, paints, and inks will fade, plastics crack, and paper can become brittle from the long-term exposure to light.

Now that you have the vocabulary of an adhesive chemist, what are you going to do with it?



Now that you have the vocabulary of an adhesive chemist, what are you going to do with it? The answer is look at the packaging your tapes and adhesives come in. Do they tell you what you want and need to know? The more you know, the easier it will be to select the right adhesive or tape to do the job. With all the time and effort you and your customers put into projects, you want to know that they will last as long as you had hoped. Use this information to determine just what sticky stuff you or your customer really wants.

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