SURFACE PREPARATION

Any adhesive, regardless of the type, can only be expected to perform well on a properly prepared surface. Most manufacturers will be quick to point out that such figures as "Tensile Shear Strength" were obtained on specimens tested in accordance with a certain standard. Included in the test will be preparation of the surfaces for bonding which is usually in accordance with another standard.

It would be quite possible to write a complete volume on surface preparation and still not cover every material, application or situation.

Although Polymark Inc. does not purport to be an expert on all types of surface preparation, we do, none the less, feel an obligation to offer some suggestions to aid the user in obtaining good bond strengths.
Some surfaces require little or no preparation and epoxies will cling to them tenaciously. An example of this is clean, dry, raw wood. Some woods, however, such as Teakwood, possess a high degree of natural oils which make bonding to it difficult to impossible. Other materials such as Teflon* or polyethylene are very resistant to bonding even with the best preparation methods known. In the middle of the spectrum, however, are materials which can be bonded successfully with proper surface treatment. These would include all types of metals, many plastics, glass and ceramics.

In order to properly understand bond strengths, the user should be familiar with the difference between adhesive and cohesive failures. Assume that two pieces of metal are partially overlapped and joined by a thin bond of adhesive. Now the specimen is placed in a machine designed to pull it apart lengthwise. The stress applied is known as "shear". The point at which the specimen breaks across the bond line is known as its "Tensile Shear Strength" and is usually expressed in pounds per square inch. By examining the bond line on the two pieces, we should find that a roughly equal amount of cured adhesive is left on both pieces. This ideal condition is known as a "cohesive break". However, if we find no adhesive left on one of the pieces (or very little adhesive) this is known as an "adhesive break" and is indicative of either poor surface preparation, the wrong adhesive, a non-receptive surface or a combination of these factors.

It is important to recognize the major hindrances to adhesion. These are:
DUST, DIRT, GREASE, CORROSION, OXIDATION, SCALE

In addition, smooth, nonporous surfaces generally provide poor bonds. This is why most woods are easy to bond. The natural porosity inherent in wood allows the adhesive to "wick" into the surface and surround the fibers providing good mechanical strength. Metals, plastics and glass, on the other hand, need to be artificially roughed-up to provide a good bond. Also, materials containing polyolefins or fluorocarbons will require some type of special pre-treatment prior to bonding.

For proper bonding, any adhesive must adequately wet the surfaces. Therefore, proper cleaning must also be considered.

In summary, we see that the two most important aspects of surface preparation prior to adhesive bonding are:
PROPER CLEANING and PROPER PHYSICAL CONDITIONING

The following is a list of materials commonly encountered in adhesive bonding with a short general description of the preparation methods commonly employed.

WOOD - Insure that the surface is dry and free from contaminants such as grease or oil. A rough sanding will aid adhesion followed by removal of sanding dust.

PLASTICS- Most plastics to be bonded will have a smooth surface; therefore, particular attention should be paid to roughing or etching the surface in addition to a good solvent cleaning. As pointed out above, some plastics (such as polyethylene) may require special types of treatment. The plastics manufacturer or distributor should be consulted in cases where surface preparation is questionable.

METALS - Two common methods of surface preparation are generally used:
  a. degreasing followed by treatment by or grit blasting, grinding, sanding or honing.
  b. chemical cleaning by one or a combination of the following methods:
    1. degreasing with solvents
    2. alkaline cleaning
    3. acid etching

GLASS - Solvent wiping and (where possible) sand blasting to improve mechanical bond are the preferred methods.

CERAMICS - Fired, unglazed ceramics generally require no preparation as long as they are clean. Glazed ceramics should be roughed-up by sanding.