Advanced Materials

HUNTSMAN

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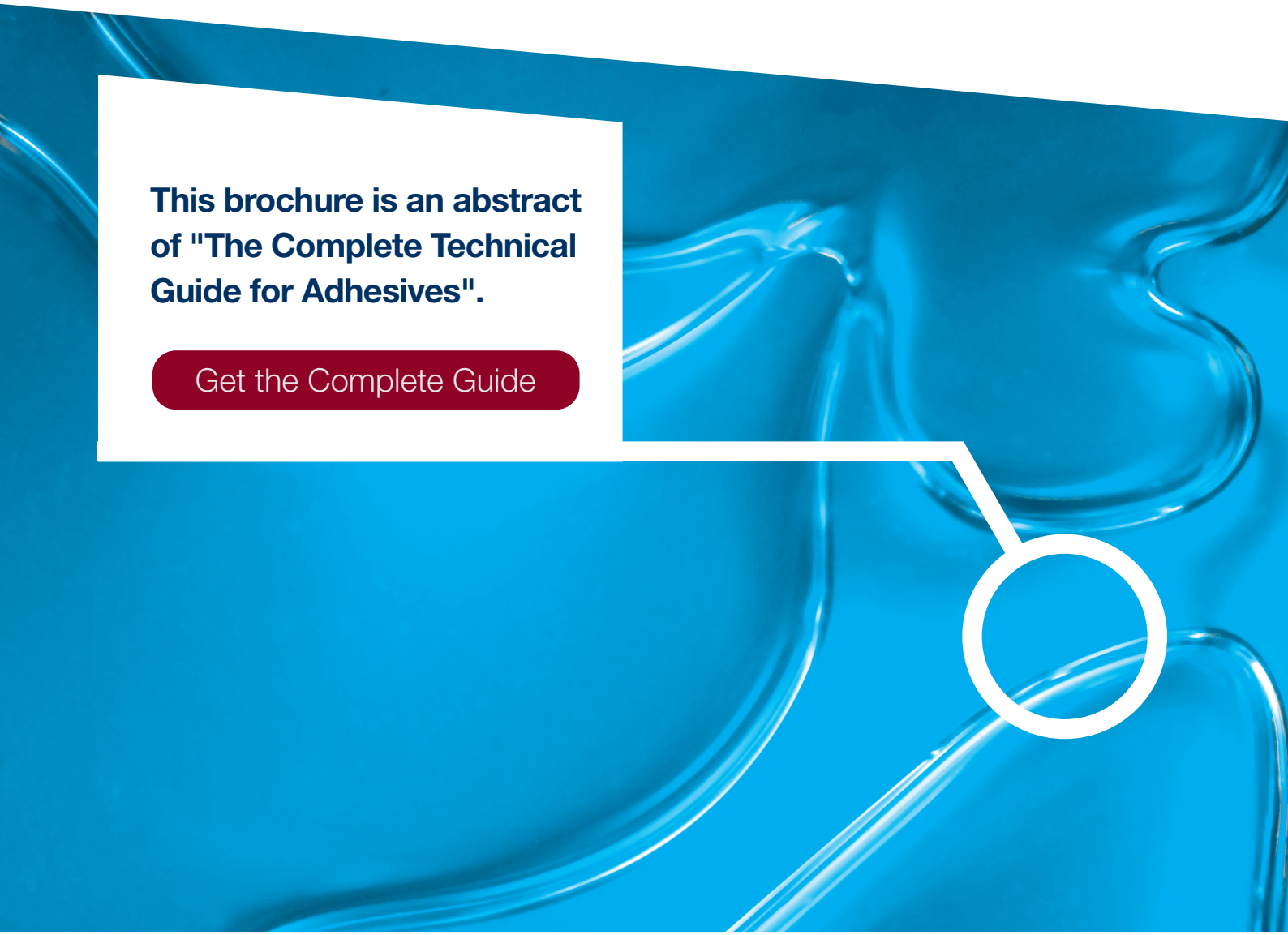
SURFACE PREPARATION AND PRETREATMENTS

The Technical Guide for Adhesives



This brochure is an abstract of "The Complete Technical Guide for Adhesives".

Get the Complete Guide

MADE POSSIBLE

3.0
SURFACE PREPARATION AND PRETREATMENTS

Bonding performance is always a combination of multiple factors, including mechanical, chemical and physical interactions.

Bonding is an interfacial phenomenon, as the adhesive forms an interface with the substrates to be bonded.

The surface conditions of the parts to be bonded are therefore a critical factor in achieving a dependable quality bond.

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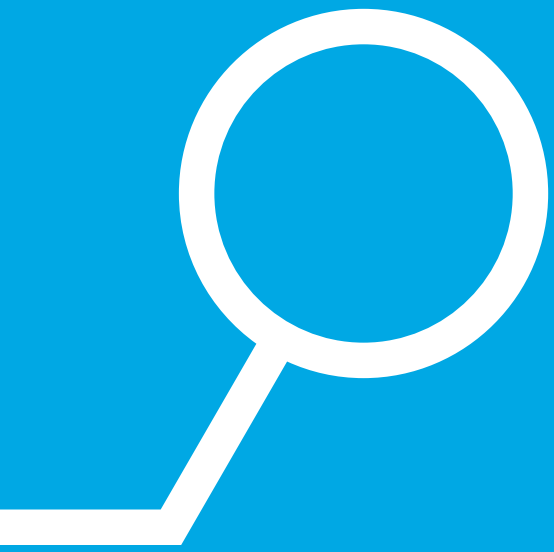


3.1 INTRODUCTION

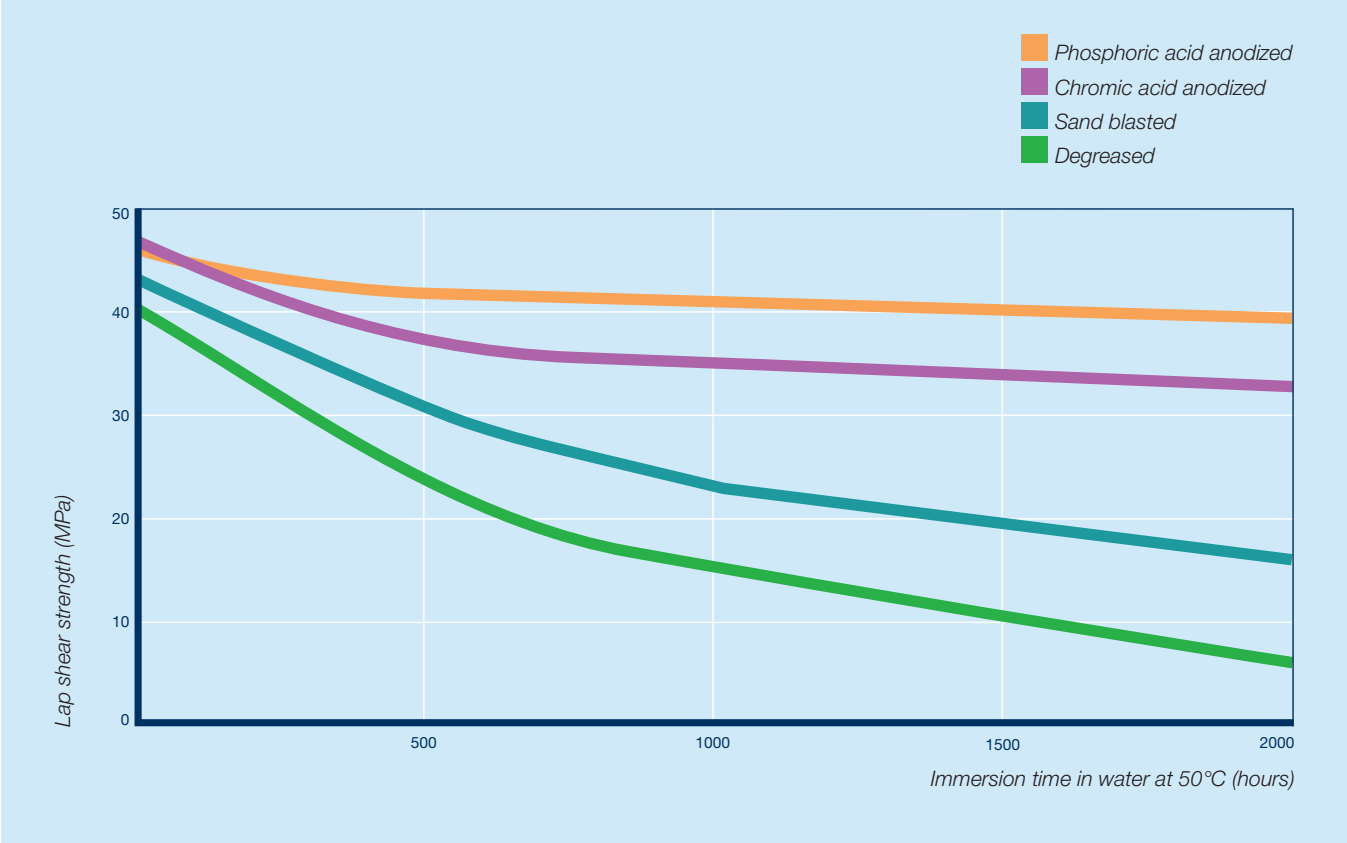
GENERAL CONSIDERATIONS

Proper surface preparation is essential for optimum adhesion between structural materials bonded with ARALDITE® adhesives.

Huntsman industrial adhesives are high performance products which adhere firmly to most materials. High strength bonds can be obtained after removal of grease and loose particles, e.g. rust, from the surfaces to be joined. However, when maximum strength and long-term durability are required, a more thorough mechanical or chemical surface pretreatment is highly recommended.

The type of surface preparation to be carried out prior to bonding depends on the required performance level (Figures 18, 19 and 20), the service conditions of the assembly and economic considerations (ratio cost vs benefit).

FIG. 18 EFFECT OF DIFFERENT SURFACE PREPARATIONS ON BOND STRENGTH DURING WATER IMMERSION FOR AN ALUMINUM ASSEMBLY BONDED WITH A ONE-COMPONENT EPOXY ADHESIVE

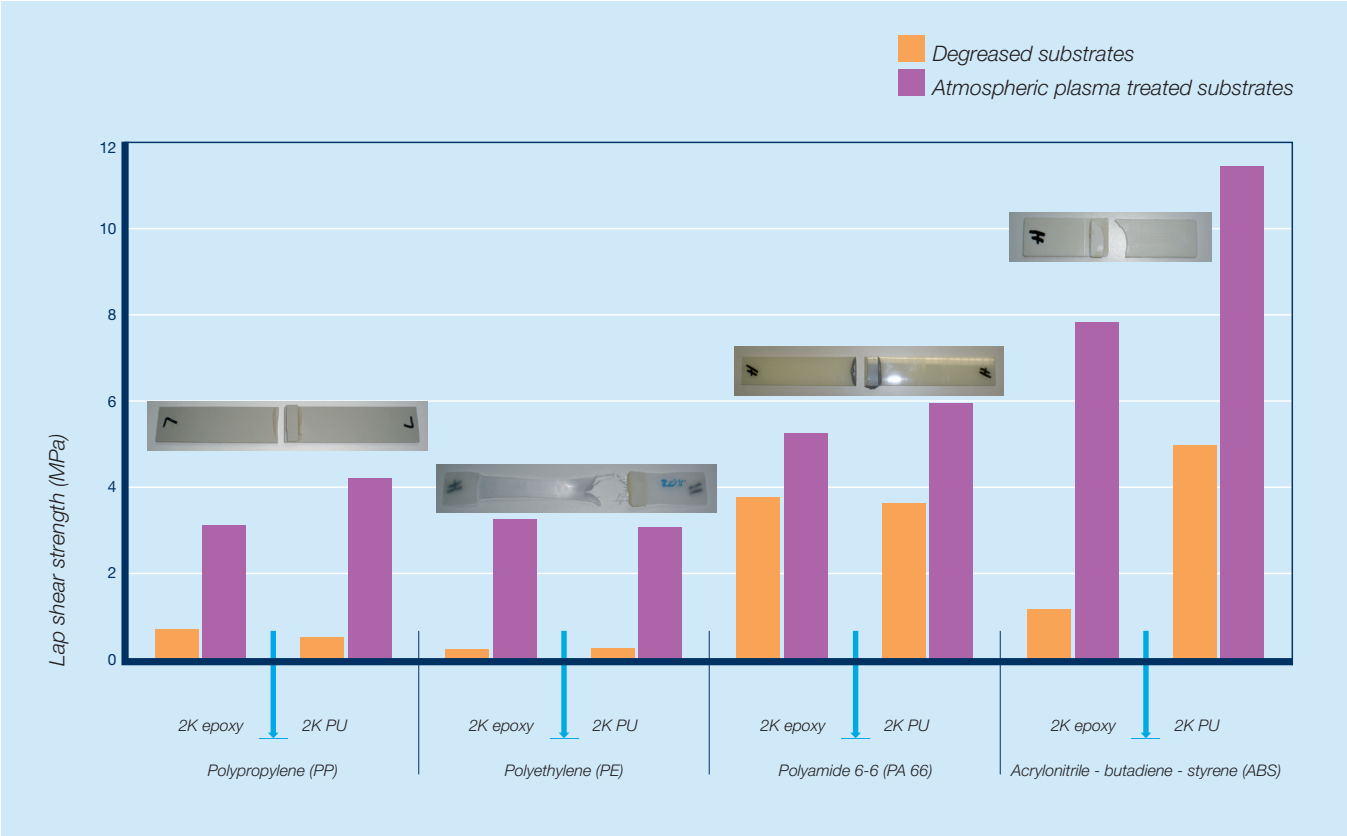


3.1 INTRODUCTION

GENERAL CONSIDERATIONS

FIG. 19 EFFECT OF PLASMA SURFACE TREATMENT ON PLASTIC BONDING

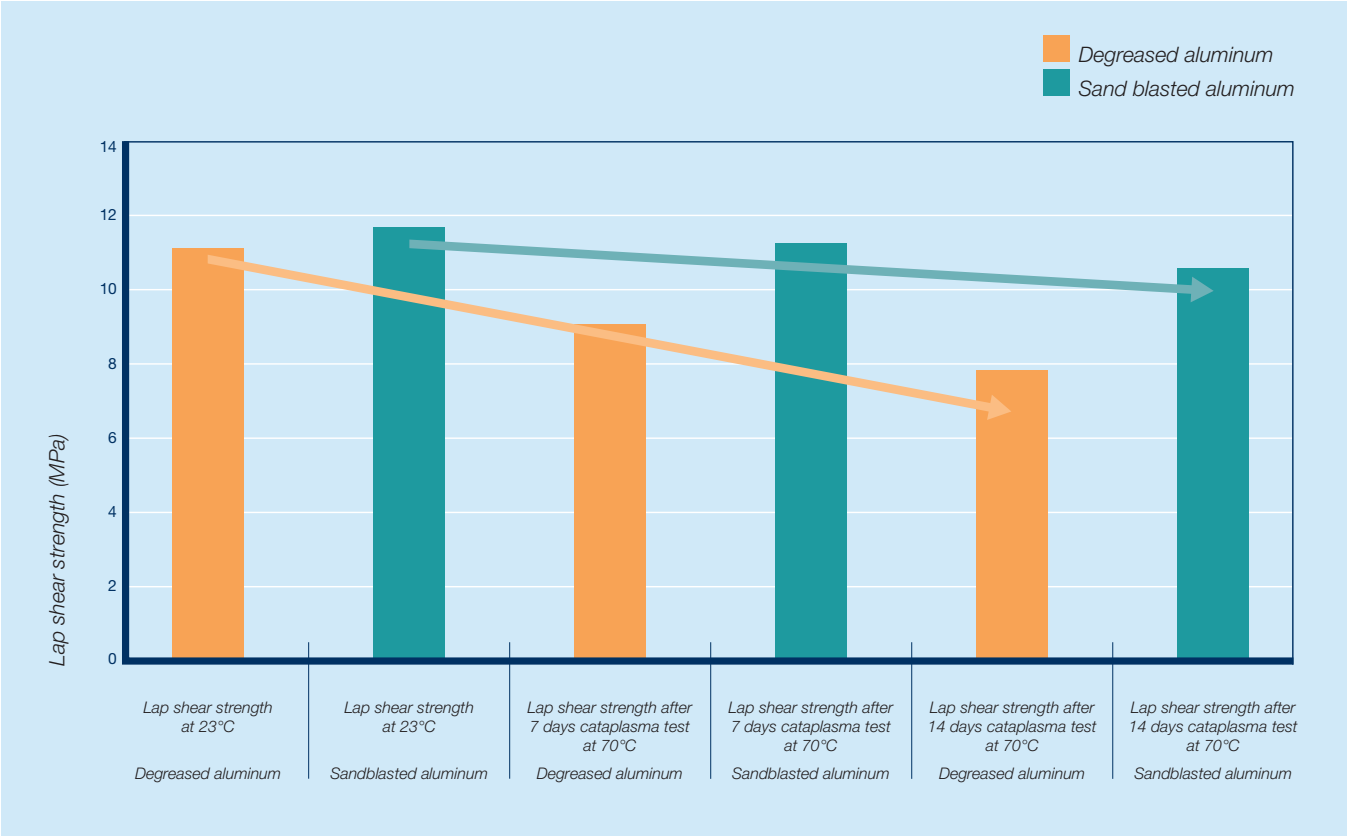
(Two-component toughened epoxy adhesive - Two-component polyurethane adhesive)



Note: systematic substrate failure on plasma-treated specimens

FIG. 20 EFFECT OF SURFACE PREPARATION ON AGEING PERFORMANCE OF ALUMINIUM BONDED WITH TWO-COMPONENT TOUGHENED EPOXY ADHESIVE

(Wet cataplasma aging)



Cataplasma test: 70°C with high humidity + thermal shock at -20°C

3.1 INTRODUCTION

WHY USE SURFACE PREPARATION?

In order to ensure an optimum wetting and a satisfactory adhesion on the substrate, a thorough surface preparation is required:

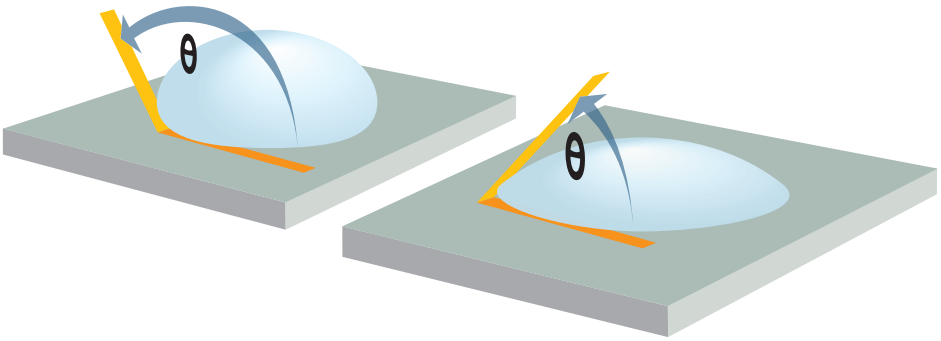
- To remove contaminants and/or low cohesion layers (oxides)
- To offer a clean surface for bonding
- To increase the bonding area
- To ensure that the substrate surface is fully wetted by the adhesive (e.g. by increasing the surface energy of the substrate)

Care must be taken to avoid contaminating the surfaces during or after pretreatment. Contamination may be caused by skin contact (clean gloves should be worn), using contaminated cleaning rags, by oil contaminated abrasives, by substandard degreasing or chemical solutions.

Contamination may also be caused by other work processes taking place around the bonding area. Oil vapors from machinery, spraying operations (paint, mold release-agent, etc.) and processes involving powdered materials must be particularly avoided.

Whatever the pretreatment procedure used, it is good practice to bond the surfaces immediately after the pretreatment has been performed i.e. when surface properties are at their best.

Note: If a delay between pretreatment and bonding cannot be avoided, optimum surface properties may be preserved by applying a suitable primer to the bond surfaces immediately after pretreatment.



WETTING ANGLES BEFORE SURFACE PREPARATION (LEFT) AND AFTER (RIGHT)

3.1 INTRODUCTION

TEST FOR A CLEAN BOND SURFACE

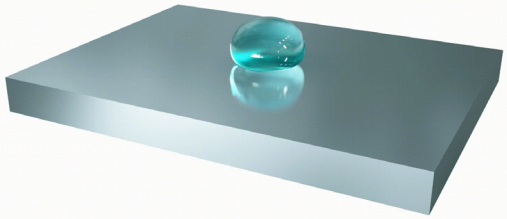
If a few drops of distilled water applied to a surface spread over it – or if, on drawing the surface from distilled water, the water film does not break up into droplets – then the surface may be assumed to be acceptably free of contamination. Uniform wetting of the surface by distilled water indicates that it will probably be likewise wetted by an adhesive.

It must be borne in mind that certain plastics, even when clean, may not be wetted by distilled water, but will be wetted by suitable adhesives. Furthermore, it should be noted that a satisfactory wetting provides no information with regards to the potential bond strength and durability of the bonded assembly. At most it is a necessary – but not sufficient – requirement for the achievement of high bond strengths.

The surface tension of plastic materials cannot be directly measured and is therefore usually determined indirectly by contact angle methods or using testing inks. Several standard methods have been developed to respond to the different types of substrates being evaluated (see literature, e.g. Adhesives Technology Handbook – W. Andrew Editions).

The water droplet test is a simple method to determine whether the surface to be bonded is clean. It is best suited to metals.

BAD WETTING



GOOD WETTING