

PICKLING TAPES FOR LOCAL PRE-TREATMENT OF METAL SURFACES

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Manufacturing processes often require the local removal of oxide layers and contaminants from metal surfaces. For example:

- Pre-treatment of joining areas on metallic structures prior to bonding.
- Removal of the oxide layer on metal prior to friction welding or friction stir welding in order to avoid incorporation of oxide in the weld seam and hence impairment of the strength and corrosion resistance.
- Local pre-treatment of surfaces prior to adhesive bonding, painting, or welding when repairing large metal structures that cannot be treated in a bath.

Status quo

At present only pickling pastes, gels, and foams are available for local pre-treatment.

Alternatively, the pickling agent may be sprayed onto the component. With each of these methods it is necessary to carefully mask the surrounding area. Pickling always has to be followed by a thorough rinsing step to remove the pickling agent. Large amounts of corrosive wastewater are produced which has to be treated prior to disposal.

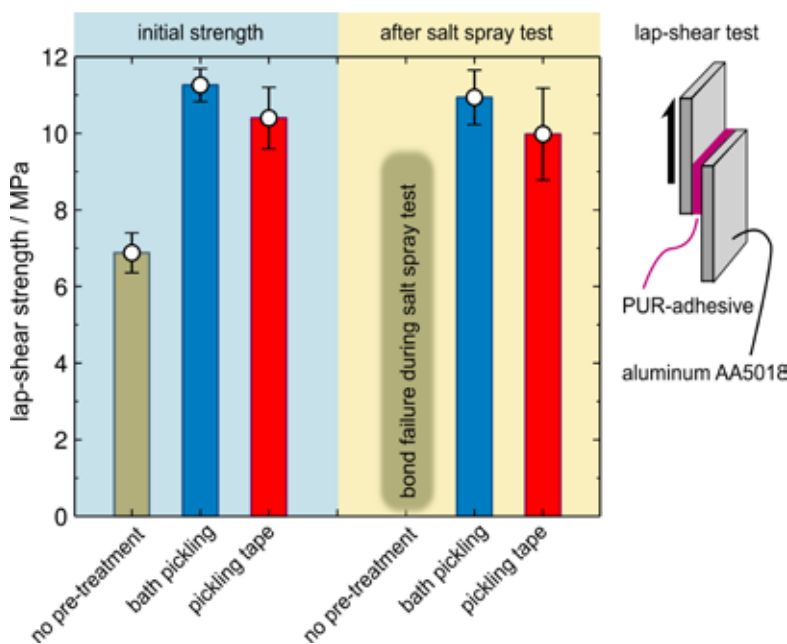
The solution

A functional adhesive tape developed by the Fraunhofer Institute of Manufacturing Technology and Advanced Materials IFAM in Bremen, Germany, enables the local pickling of metal surfaces prior to adhesive bonding, painting, or welding.

Unlike when using conventional pickling pastes, the subsequent cleaning is simple and no corrosive wastewater is produced. The handling is easy, safe, and environment-friendly.

A pickling agent integrated into a pressure sensitive tape enables local pre-treatment of metal surfaces. It can be removed after the pickling without residues. Thereafter, simple wiping with a wet cloth suffices.

Practical tests have demonstrated that the pre-treatment of aluminum using the pickling tape prior to adhesive bonding or painting compares well to conventional bath methods. The bonding properties are greatly improved over untreated test specimens. This is particularly so for test specimens that are exposed to corrosive environments. Painted AlMg3 specimens also showed significantly improved corrosion resistance in the acetic salt spray test compared to non-pickled reference specimens.



2 Lap shear strength: The adhesion of the adhesive to the aluminum surface is improved by use of the pickling tape. The pickling tape is as effective as conventional treatment in a pickling bath.

Advantages of the pickling tapes

- Local pre-treatment of metal surfaces
- Self-adhesive
- Removable without residues
- Simple subsequent cleaning by wiping with a wet cloth
- Removal of accumulated layers and pre-applied conversion coatings (maximal depth 1 µm)
- Improved strength of bonded joints especially under corrosive conditions
- Improved corrosion resistance of painted aluminum sheets

Application

- Local reworking during production processes
- Maintenance, repair, overhaul
- Local pre-treatment of large components prior to bonding, if bath treatment is inefficient or impossible

Portfolio of the Fraunhofer IFAM

- Adaptation of pickling tapes to customer-specific requirements
- Development and validation of processes for local pre-treatment
- Analytical characterization of pre-treated surfaces
- Performance tests on bonded joints and painted components, including corrosion tests

1 Application of pickling tape prior to the repair of damaged paint. The paint has been removed by mechanical abrasion and the pickling tape is used for pre-treatment of the metal surface. After removal of the tape and simple cleaning with a wet cloth, the surface is ready to be painted anew.