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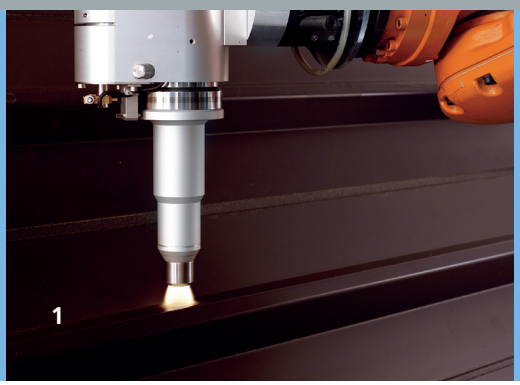


1 *Cleaning and activation of complex FRP surfaces using AP plasma.*
2 *Customized pre-cleaning using CO_2 snow.*

Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM – Adhesive Bonding Technology and Surfaces –
Wiener Strasse 12
28359 Bremen | Germany

Institute director
Prof. Dr. Bernd Mayer

Contact

Atmospheric Pressure Plasma Technology
Dr. Jörg Ihde
Phone +49 421 2246-427

Plasma Technology and Surfaces – PLATO –
Dr. Ralph Wilken
Phone +49 421 2246-448

ap-plasma@ifam.fraunhofer.de

www.ifam.fraunhofer.de

CLEANING AND ACTIVATION OF SURFACES USING ATMOSPHERIC PRESSURE PLASMA TECHNOLOGY

Cleaning …

… status quo

The contamination of surfaces with auxiliary processing materials such as release agents and lubricants is a common problem in industrial production. In order to guarantee optimum adhesion of adhesives and coatings to these surfaces, it is therefore usually necessary to undertake cleaning processes.

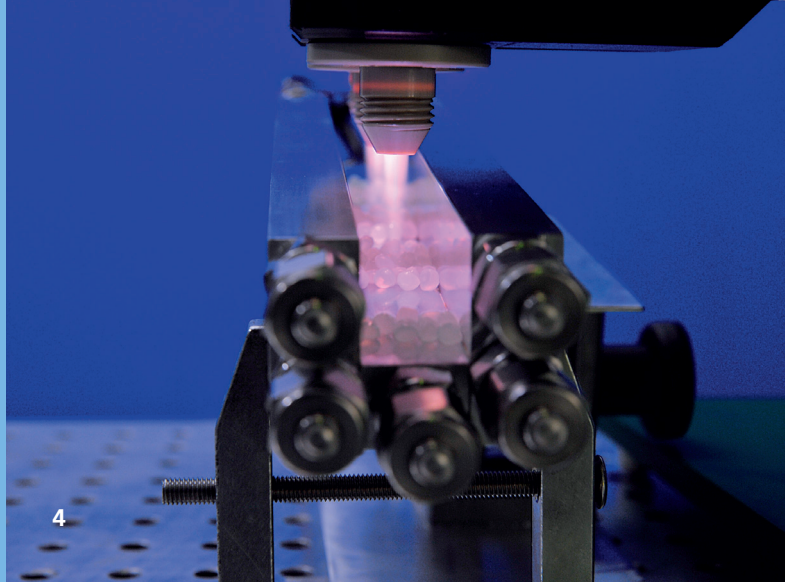
Many of the cleaning processes still used today involve the use of solvents or aqueous systems. These processes have disadvantages such as

- Space required for the baths and drying
- Costs for disposal and energy
- Emissions
  (Volatile Organic Compounds; VOCs)

… efficient and environmentally friendly processing using AP plasma technology

Atmospheric pressure plasma technology (AP plasma technology) is an effective, eco-friendly alternative method for cleaning surfaces. Here the workpiece to be cleaned is exposed to an AP plasma produced from air with treatment speeds up to 100 m/min. The plasma removes organic contaminants on the surface via a quasi controlled "cold" combustion process.

In order to remove more stubborn contaminations such as large particles and thick layers, the AP plasma process can be readily combined with other processes for coarser cleaning such as CO_2 snow or ice blasting.



Activation …

… status quo

Inadequate adhesion of adhesives and coatings is a common issue for the polymer processing industry. The incompatibility of the surface properties of many polymers and composite materials with adhesives and coatings often restricts the use of more eco-friendly and efficient materials.

This can hinder or even prevent the introduction of innovative processes, for example, the bonding of large fiber reinforced plastic (FRP) structures or the realization of new lightweight hybrid structures.

… AP plasma technology opens up new material properties

For the activation of polymers AP plasma can be generated with favorably priced compressed air. The excited atoms and molecule fragments that are present in the plasma can be incorporated into the polymer surface to form functional groups. These groups improve the wetting properties of the surface but do not change the bulk material properties of the polymer.

This activation can also be carried out on (nano)particles, e. g. carbon nanotubes (CNTs), to enhance, for example, the dispersion of pigments in paints/lacquers (Fig. 3).

Examples from industry

- Activation of bond line in polypropylene headlight covers prior to bonding
- Preparation of ethylene propylene diene monomer (EPDM) profiles for flock spraying without roughening and solvent primers
- Bonding of FRP components

Advantages of AP plasma technology

- Suitable for in-line applications
- Can be incorporated into existing production lines
- Can be tailored for specific customer demands
- Suitable for robot technology
- Low space requirements

Portfolio of the Fraunhofer IFAM

- Consultancy
- Provision of samples
- Process development
- Production and plant concepts
- Technology transfer

3 *Improvement of the dispersion properties of fillers (e. g. CNTs) via AP plasma treatment (right: treated).*

4 *Atmospheric plasma treatment of temperature-sensitive bulk goods (e. g. small plastic parts, seeds).*

Adhesion strength of different plastics – untreated and after AP plasma activation –