



1–3 Coating of a processed wafer with a pre-applicable adhesive via spincoating.

PRE-APPLICABLE ADHESIVES FROM FRAUNHOFER IFAM

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

Dr. Jana Kolbe
Phone +49 421 2246-446
jana.kolbe@ifam.fraunhofer.de

Andreas Lühring
Phone +49 421 2246-494
andreas.luehring@ifam.fraunhofer.de

Dr. Matthias Popp
Phone +49 421 2246-650
matthias.popp@ifam.fraunhofer.de

www.ifam.fraunhofer.de

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Pre-applicable adhesives allow adhesive application and the actual joining process to be carried out at different times and at different places. The adhesive is only cured after the substrates have been brought together. However, this technology is not available for all adhesives. The adhesives must be specially adapted. In this context, the Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM develops Pre-Applicable Structural Adhesives (PASA®) to meet the individual requirements of customers.

Benefits

Components that are pre-coated with adhesive have considerable benefits for users in a wide range of industries, which use adhesive bonding technology:

- The adhesive no longer has to be mixed and applied on site.
- Adhesive application can be carried out by the component manufacturer or can be contracted out.
- Methods for applying the adhesive are more efficient.
- The required job safety measures for the joining process are less complex.

Requirements

Besides standard practical demands, there are a number of special requirements for pre-applicable adhesives: A tack-free, which means non-sticky, surface and long storage time (e.g. up to 6 months) after pre-application of the adhesive are essential. In addition, rapid curing is often desirable besides the long storage time of the pre-coated component.



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Compared with these adhesives the whole process from adhesive formulation to application and later curing must be considered in detail in order to optimally utilize all the benefits.

A variety of approaches have been used in the work that has been undertaken up until now.

Results of ongoing adhesive development work at Fraunhofer IFAM...

| ... for assembly and joining techniques for microelectronics and microsystem technology

Reactive adhesive with a 2-stage curing mechanism

The adhesive is a 1-component hybrid adhesive with acrylate and epoxy groups. It is applied as a liquid to the component. Subsequently a radical curing of the acrylate groups via UV light follows. The adhesive thereafter has a dry, tack-free surface. The resulting coated products, for example wafers, can be stored at +6 °C until they are required for further processing. The second curing step is carried out after joining the components – for example in a different production location or by the end-user – at elevated temperature (90 °C in the adhesively bonded joint).

Example

Application of the adhesive on processed wafers for RFID applications (Fig. 1-3).

| ...for PASA® technology for structural adhesive bonding

Reactive dispersion adhesive

This epoxy based adhesive is applied as an aqueous dispersion to the component. After drying, the component has a tack-free coating. The actual curing of the adhesive occurs at higher temperature (e.g. 160 °C). The pre-coated non-cured components can be stored at room temperature for several months.

Example

Coating of sheet metal using the coil-coating process for later use for reinforcement in car manufacture.

Reactive hotmelt

In contrast to commercial reactive polyurethane hotmelts with capped isocyanate groups, Fraunhofer IFAM has developed a reactive hotmelt based on an epoxy resin (Fig. 4 + 5). This adhesive is solid as well as tack-free at room temperature and must be melted to be applied. The melting is carried out at about 80 °C.

The subsequent curing of the adhesive occurs at a considerably higher temperature (> 120 °C). This can last from a few seconds up to 30 minutes depending on the curing temperature and composition of the adhesive. The pre-coated components can be stored for several months.

Localized heating via induction or infrared lamps can be used for rapid curing.

Example

Induction bonding of fasteners in the car manufacturing industry.

Our work for you

The holistic consideration of the whole adhesive bonding process is the key to introducing pre-applicable adhesives into industrial production. We will gladly help you to select a suitable pre-applicable adhesive and to customize that adhesive to your specific needs.

- 4 *Pre-applicable adhesive on a metallic fastener.*
- 5 *Rapidly cured PASA® adhesives can bear high structural loads within seconds.*