

CUSTOMIZED ADHESIVE DEVELOPMENT AT FRAUNHOFER IFAM

**Fraunhofer Institute for
Manufacturing Technology
and Advanced Materials IFAM
- Adhesive Bonding Technology
and Surfaces -**

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Increasing requirements on productivity, resource efficiency, and occupational health and job safety in many industries are requiring the development of highly specialized adhesives. One of the main areas of work of Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM is the development of such adhesive systems.

Prior to the development of an adhesive, market research is carried out to check whether any commercial systems already exist. A development program is only initiated once it is sure that there are no existing commercialized solutions for a customer-specific problem. A prerequisite for rapid and successful development work is in-depth market knowledge of adhesives and raw materials.

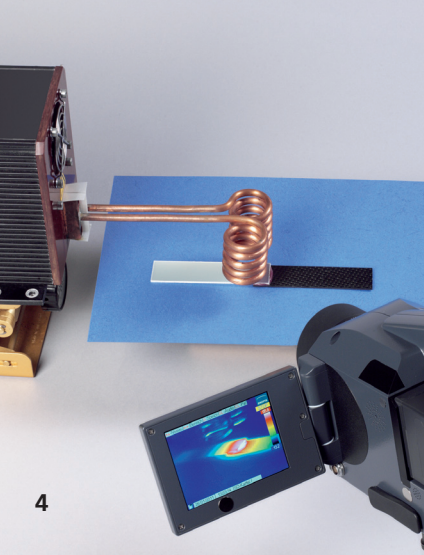
Key research areas of Fraunhofer IFAM

- Pre-applicable adhesives
- Detachable adhesively bonded joints
- Rapid adhesive curing
- Electrically conducting adhesives
- Adaptation of adhesive formulations to application and process parameters

Examples of current research work

Pre-applicable structural adhesives – PASA® technology from Fraunhofer IFAM

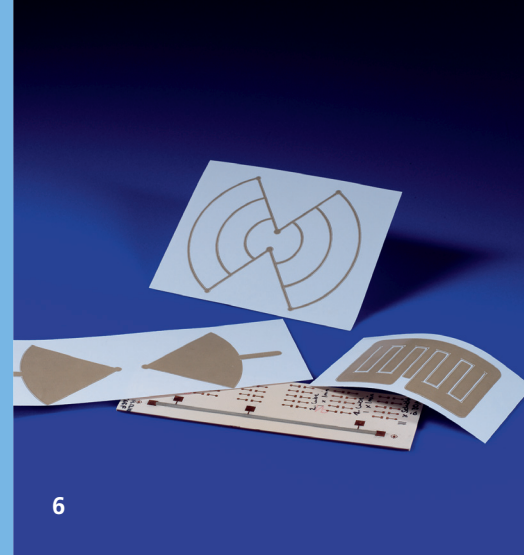
Adhesives that are solid, tack-free, and stable to storage at room temperature have the big advantage that the adhesive application and curing can be carried out separately – at different times and in different places.



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For example, there is no need for complex adhesive application units in car production lines if the components have already been coated by the supplier with novel adhesives (pre-applicable structural adhesives; PASA®) developed by Fraunhofer IFAM (Fig. 1 + 2).

Detachable bonded joints

Products that are intended to be recycled at the end of their service lives or bonded components that need to be repaired require adhesively bonded joints that can be detached on demand in a non-destructive way. Fraunhofer IFAM has, for example, developed an adhesive that adhesively debonds from substrates on being subjected to a direct current of 48 volts and simultaneously heated to 65 °Celsius (Fig. 3). Other methods for “debonding on demand” are also being utilized and specifically applied.

Rapid adhesive curing – induction curing and microwave curing

The application of electromagnetic fields allows adhesives and/or substrates to be heated to the desired temperature within seconds (Fig. 4). This enables curing times to be drastically reduced. Alternatively, adhesives can be modified in such a way that they can be heated by microwave radiation and can hence be cured faster (Fig. 5).

Electrically conducting adhesives for assembly and joining techniques

In areas where product development is highly dynamic such as packaging for RFID tags and solar modules there is a constant need for new adhesives. Fraunhofer IFAM formulates isotropic and anisotropic electrically conducting adhesives for a variety of applications (Fig. 6). Some of these adhesives can be made available as pre-applicable adhesives (PASA® technology).

Adaptation of adhesive formulations to application and process parameters – adhesive evaluation for automated processes

Although the manufacture of adhesively bonded joints on aircraft that are of key importance for safety has up until now been largely carried out manually, the need for further cost reduction means that fully automated processes are being adapted. Fraunhofer IFAM is assisting here by evaluating machine processable adhesives for the specific requirements of the aircraft manufacturing industry.

Our work for you

For many applications there is already a suitable adhesive, but for others not. In the case of the latter, we can help you develop new adhesive systems.

- 1 *Rapidly curing PASA® adhesive on a metal fastener.*
- 2 *Chips can be coated with a pre-applicable adhesive at wafer level. Subsequent adhesion is induced by heat.*
- 3 *The bonded joint formed using an adhesive developed at Fraunhofer IFAM can, under defined conditions, be easily detached on demand by hand.*
- 4 *Rapid adhesive curing via induction. A high resolution heat imaging camera allows the temperature distribution to be accurately monitored.*
- 5 *Microwave oven at Fraunhofer IFAM for qualifying adhesive bonding curing processes.*
- 6 *Customized electrically conducting adhesive formulations for different manufacturing processes and profile of requirements, for example flexographic printing and offset printing.*