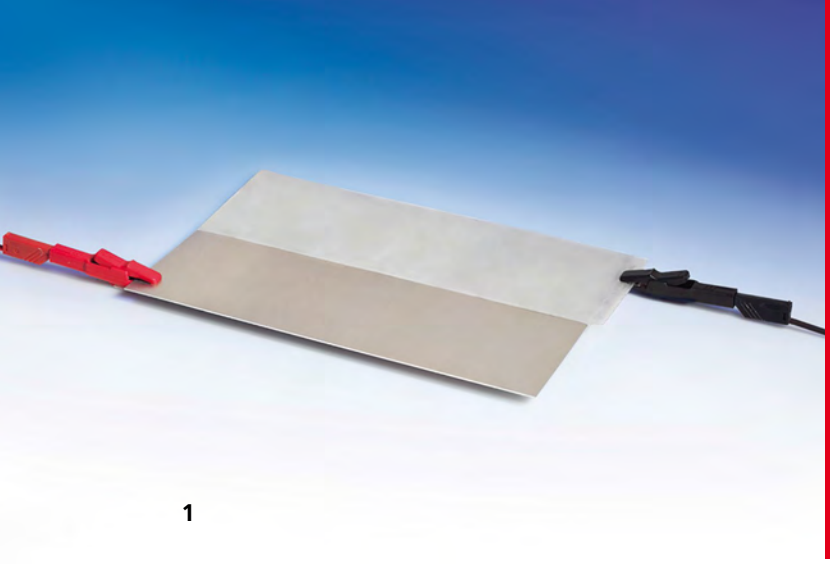

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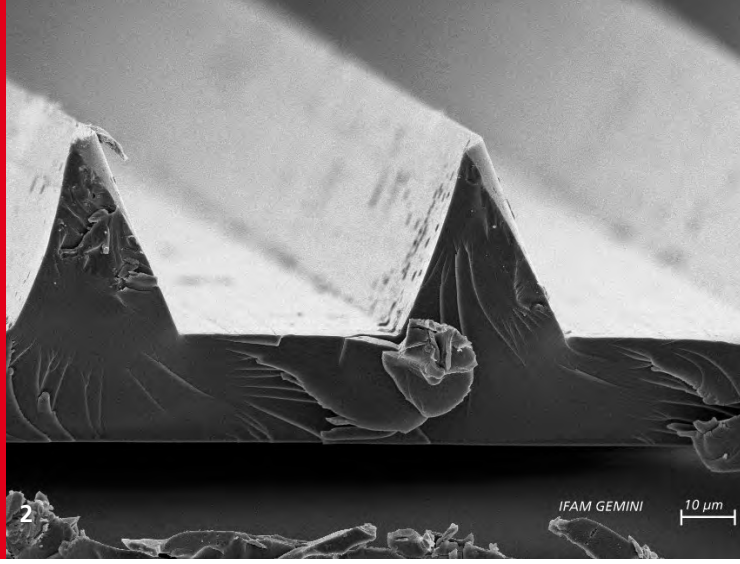


2

CHARACTERIZATION OF SURFACES AND MATERIALS

Fraunhofer IFAM has built up in-depth expertise in surface technology, acquired in projects with partners from a range of industries and involving innovative products and processes. A number of current R&D areas are discussed here to give you an idea of the scope of the work in the area of surface technology. For further information see the relevant links.

Functional adhesive tapes for local pre-treatment of aluminum

Anodization is often used to treat aluminum components prior to adhesive bonding or lacquering and is usually carried out in immersion baths. A functional adhesive tape for local anodization has been developed at Fraunhofer IFAM for applications where bath treatment is impossible (repairs, reworking, treatment of large components).

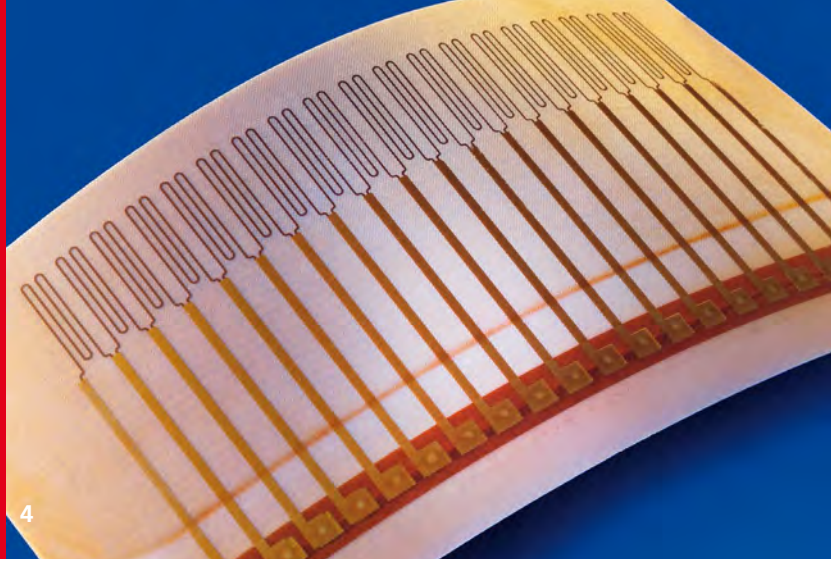
The anodizing tape is bonded to the surface to be treated and a DC voltage source is connected to the component and to the cathode integrated into the adhesive tape. After anodization the adhesive tape can be removed free of residues from the surface. The procedure is simple and effective, reducing the use of chemicals.

→ **www.ifam.fraunhofer.de/adhesivetapes**

Quality assurance of riblet surfaces

Innovative surface concepts help, for example, to reduce the drag of aircraft and consequently lower fuel consumption and CO_2 emissions significantly. In order to be able to assure the effectiveness of the surface microstructures (so-called riblets; Figure 2), any abnormal structural geometry must be detected at an early stage. Such deviations can arise, for instance, due to incorrect coating application or the effects of erosion during usage. Fraunhofer IFAM hence developed an optical system for measuring the quality of riblet coatings. This NDT technique detects even minute structural abnormalities in extremely short inspection times. Therefore, the test system can successfully be deployed for maintenance work as well as production processes.

→ **www.ifam.fraunhofer.de/en/riblet**



Anti-icing technologies

The icing of surfaces is very costly and impairs the functioning and safety of a wide range of machinery and equipment, including means of transportation such as aircraft and rail vehicles and also cooling and ventilation systems or wind turbines.

Fraunhofer IFAM develops tailored solutions to meet the relevant technical requirements. This includes heatable coatings, surfaces with poor water wetting and poor ice adhesion as well as coatings that depress the freezing point. The effectiveness of these anti-icing technologies is tested at Fraunhofer IFAM under near-real conditions. An icing laboratory with integrated wind tunnel is available for this work: Characteristic icing tests can be simulated and further research regarding ice adhesion is possible to be processed.

→ **www.ifam.fraunhofer.de/antiice**

(Combating) Corrosion of historic organ pipes

The distinctive sound of historic lead organ pipes are a feature of the famous Schnitger organs found in the northwest of Germany. Over the last 10 to 15 years, corrosion damage has become an ever greater threat to this cultural and historic treasure. A pilot project is being carried out by Fraunhofer IFAM, in conjunction with the Institute for Materials Testing (MPA) and under the leadership of the University of the Arts Bremen, to investigate the cause of the corrosion and develop protective measures. The damage is being analyzed in detail using microscopic and surface-analytical techniques in order to develop protection systems for preserving these and other organs.

→ **www.ifam.fraunhofer.de/organpipes**

Integration of printed sensors into composite materials

The integration of sensors into fiber reinforced plastics is often desirable for quality control or during usage. The Functional Printing department is developing printing processes for functional structures, such as temperature and strain sensors including lines and contacts, on and in fiber reinforced plastics. This involves printing metal-filled pastes onto tissue which can be used as an impregnatable textile layer in the FRP manufacturing process. The advantages of this approach are the minimum effect on the mechanical properties of the FRP and the customized design and production of the sensor structures which are ideally positioned on or in the component. There are applications for this technology in the aviation and aerospace industries, in car manufacturing, and for wind turbines. The work on integrating printed sensors into FRPs involved a joint project funded by the Federal Ministry of Education and Research (BMBF).

→ **www.ifam.fraunhofer.de/printedsensors**

1 *Functional adhesive tape for the local anodization of aluminum.*
2 *Microstructured coating for reducing drag (riblet coating or sharkskin coating).*
3 *Historic organ in the Evangelical Church of St. Marien and Pankratius: Mariendrebber.*
4 *Sensors and lines printed on glass tissue, integrated by Invent GmbH into GFRP.*