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1 *Erosion resistant elastomer coating on a front wing section.*

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

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## COATINGS WITH EXCELLENT EROSION RESISTANCE AND FRICTION RESISTANCE

### Protection against mechanical loads and increasing costs

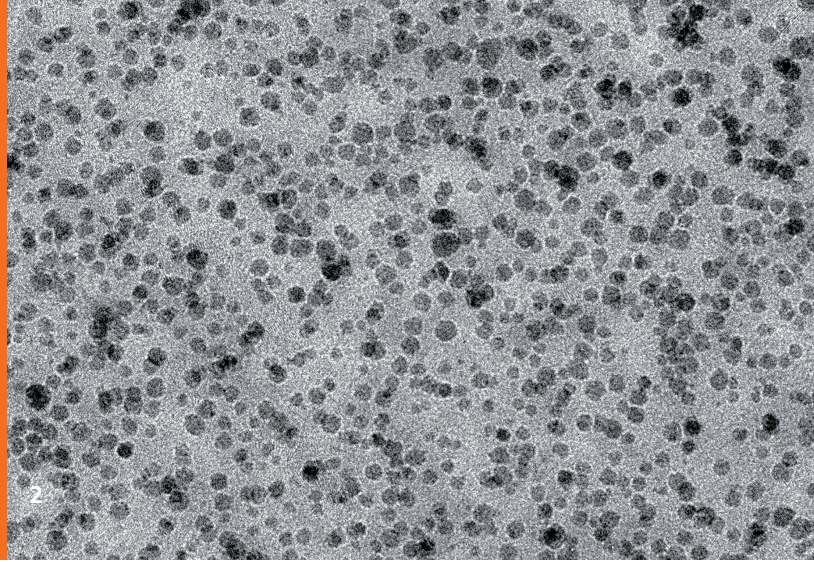
Sand and rain generally cause erosion and damage to components. When two component surfaces rub against each other, tribological forces also act on the surfaces. All these mechanical effects lead to increased component wear and shortened service life.

As a consequence, the required maintenance and repair work increase. In some cases, early replacement of the relevant component may be necessary. All told this means higher maintenance costs and hence higher overall costs for operating any given plant.

### Customized coatings from Fraunhofer IFAM

The section Paint/Lacquer Technology at Fraunhofer IFAM is actively developing coatings having high erosion resistance and excellent tribological properties. The objective is to improve the service life of components. A variety of concepts are being developed, each tailored to the relevant prevailing conditions in order to give the coatings the necessary properties.

The mechanical loads and stresses which act on coatings depend on the area of application, for example different coating systems are required for cars, aircraft and wind turbines. There are a variety of options for giving the relevant coatings the required mechanical resistance.



### Protective layer concepts for high mechanical loads

- The development of new coatings based on highly elastic polymers and special fillers for high erosion resistance (Fig. 1).
- The use of novel reinforcing fillers, based on inorganic and organic materials, for coating systems that are already in use and for new systems.
- Use of inorganic and organic nanoparticles in existing and new coating systems (Fig. 2).
- Development of high-strength coatings having special slip and antiblocking properties to generate surfaces having minimal frictional resistance.

### Testing and analysis of the erosion and friction resistance of coatings at Fraunhofer IFAM

Once customized coatings have been developed it is essential to test and analyze the new systems. Fraunhofer IFAM has extensive know-how in materials research and testing which it benefits from.

- Various mechanical tests for simulating abrasion (e. g. taber abraser test).
- Sand jet and water jet tests for measuring the erosion resistance of coatings to solids and liquids.
- Various tests for measuring elasticity (e. g. impact test; micro-penetration hardness test).
- Instrumental characterization of coatings for their viscoelastic film properties as a function of possible temperature changes (differential scanning calorimetry, DSC; thermomechanical analysis, TMA; dynamic mechanical analysis, DMA).
- Damage evaluation and inspection by scanning electron microscopy (SEM), atomic force microscopy (AFM) and optical microscopy.

### Range of services offered by Fraunhofer IFAM in the area of mechanically resistant coatings

- Development of concepts for erosion resistance and friction resistance based on organic layers.
- Development of model formulations with tailored mechanical properties for specific applications.
- Testing and qualification of coatings for their mechanical strength.
- Analysis and testing of the usability of anti-erosion and anti-abrasion additives in standard organic coating systems.
- Optimization of the application of erosion resistant and friction resistant coatings on different substrates.
- Evaluation and analysis of coating damage caused by mechanical loads.