

Ceramic Coatings for Friction Shims

Ceramic coatings can be produced economically using the aerosol deposition coating method. For the first time, this enables nickel-phosphorus-free friction shims for application temperatures of up to 700° C.

Friction shims are needed in applications where high torques are transmitted without having to design the components more massively. They are currently coated with nickel-phosphorus in which diamonds are embedded. This increases the friction force of the discs and thus creates a stronger connection between two components. The size and number of diamonds are matched to the surface of the components to be joined.

Ceramic coatings now offer an alternative to the conventional process. The required roughness and strength is achieved by structuring the surface itself and then coating it with ceramics, for example aluminum oxide. According to current results, this combination enables at least a six-fold increase in frictional force compared with the untreated surface. Compared with conventional coating, the expensive raw material diamond can thus be saved, while at the same time eliminating the need for nickel-phosphorus, which is harmful to health. This is particu-

larly relevant because of the steadily increasing requirements for occupational safety in manufacturing processes due to legal regulations.

The ceramic also increases the operating temperature by about double. Previous coatings can only be used up to 400 °C and are electrically conductive, which limits their range of application. With ceramic coatings, they can be used up to the temperature limit of the shim, usually 700 °C, and also have an electrically insulating effect.

Thin ceramic coatings from 0.5 µm

Conventional methods for coating ceramics are not capable of producing the required few µm thin layers. This is where aerosol deposition comes into play. Aerosol deposition enables thin coatings with ceramics such as $\alpha\text{-Al}_2\text{O}_3$ to be produced cost-effectively at room temperature. This is another reason

About Aerosol Deposition

Aerosol Deposition enables the production of thin metal and ceramic coatings at room temperature on all types of materials. Material particles are accelerated to a speed of several hundred meters per second with the aid of a carrier gas. These then hit a surface, the so-called substrate, where they form a closed and dense film.

the method was further developed for industrial use in recent years. Other ceramic coating methods require high temperatures and complex pre-processing of the substrate. Neither is required for aerosol deposition. It also features outstanding adhesion and density. This is precisely why it is ideal for applications where high-performance coatings are needed.



Nozzle during aerosol deposition. (© Heraeus)

Friction Shims Push Performance Limits

Friction shims are very thin discs or foils of steel with a hardened and textured surface that presses into softer opposing surfaces. The resulting increased strength of the connection between two components allows torque to be increased or components to be reduced in size for the same performance. For this reason, they are needed in numerous applications where high-performance but increasingly compact and lightweight designs are required. For example, in propulsion technology, wind turbines, robotics or the automotive industry. ◀

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