

OR0808

## Deposition of N, Si, F and O-doped Amorphous Carbon-Silicon Coatings in an Industrial DC-PACVD-System

Daniel Heim<sup>1</sup>, Christian Forsich<sup>1</sup>, Andreas Gebeshuber<sup>2</sup>

<sup>1</sup>University of Applied Science Wels, Wels, Austria <sup>2</sup>Rubig GmbH & CoKg, Wels, Germany

daniel.heim@fh-wels.at

Amorphous carbon-silicon (a-C:H:Si) coatings show very promising properties for a broad field of applications. By doping these coatings with N, F or O the properties of the resulting coatings like hardness, adhesion, internal stress, surface energy, chemical behavior and tribological behavior can be altered and in this way tailored and optimized for specific application.

A-C:H:Si coatings were deposited in an industrial DC-PACVD-system in a pressure range normally used for plasma nitriding. HMDSO is used as Si-precursor in mixtures with Ar, H<sub>2</sub>, C<sub>2</sub>H<sub>2</sub> and CH<sub>4</sub> as process gas. For doping O<sub>2</sub>, CF<sub>4</sub> and N<sub>2</sub> additions are used. The depositions were done on just polished, pre-nitrided and also on pre-nitrided and additionally post-oxidized samples. Samples were posed at different position in the system with a high loading. In this way the homogeneity of the resulting coatings over the charging area was investigated.

The coated samples were characterized by optical microscope, GDOES, SEM and EDX. Mechanical properties were studied by a Fischerscope tester. Adhesion of the films was measured by scratch tests and Rockwell indentation tests. The corrosion behavior is determined by salt spray tests. The tribological behavior of the resulting coatings was investigated using a pin-on-disk tribometer.

The studies show that by deposition a-C:H:Si-coatings in a industrial DC-PACVD-system the properties of the coatings also can be significantly changed by doping the coatings with N, O or F. Especially tribological properties can be influenced: frictions coefficients can be remarkable reduced by doping a-C:H:Si-coatings. The dependency of the friction coefficient from humidity and roughness of the surface can be notable reduced.

Even at high loadings a high homogeneity of the thickness and of the chemical composition of the coatings all over the charging area can be achieved and coating of complex geometries and inner walls are possible.

### Keywords

DLC

PACVD

a-C:H:Si

Doping Effects

Tribological Behavior