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Properties of Super-hard Carbon Coatings deposited by pulsed DC-Arc-ProcessWerner Grimm¹¹INOVAP GmbH, Radeberg, Germany

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Super-hard Carbon Coatings (SHC) have a typical ta-C-structure without hydrogen. Coatings on steel with a thickness of several micrometers are characterized by a hardness of more than 3.500 HV0.002 and a good adhesion (HF1) on steel substrates and hard materials.

The pulsed DC-Arc-Process (PulsArc) is an effective method for super-hard carbon coatings (SHC) on tools and machinery components. This deposition method is working similarly to the well-known vacuum arc process. High-current pulses are superposed to the DC-current sustaining the vacuum-arc discharge. To allow homogeneous deposition in a chamber three PulsArc evaporators are implemented in a PVD-coating system. Deposition rates up to 100 nm/min can be obtained on the rotating substrates (three rotating axes of the substrate holders).

New results to the physical properties of SHC-coatings on steel substrates and hard materials are shown in the contribution. The pulsed DC-Arc-Process gives new opportunities to the creation of coating conditions and process schedules.

The SHC-coating results are characterized by hardness measurement using nanoindentation, friction and wear testing using oscillating sliding testing, as well as structural analyses. The mechanical, tribological and structural results and their dependence on deposition conditions are discussed. In the conclusion it is shown, how the properties of the coatings can be improved by the modification of deposition parameters.

Keywords

ta-C

DLC

vacuum arc

pulsed DC-arc