



## Hydrogen free Carbon Coatings for Automotive and Industrial applications

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Nanostructured and amorphous coatings play an important role in today's automotive and industrial applications. There are huge areas for application for these kinds of coatings – first of all the automotive market, but also traditional applications like cutting or forming tools.

Going back in the history there was a strong development starting from the first nanostructured WC-C:H sputtered coatings soon followed by hybrid a-C:H coatings. Developments of WC-C:H coatings showed that the coating structure can be tuned to the requirements of the tribological application. The combination of the a-C:H layer with a sputtered multilayer structure could realize a gradual adaptation of the Young's modulus of the relatively soft steel as base material to the very hard a-C:H-DLC top layer and as such deliver toughness as well as hardness to the system of substrate and a-C:H coating. New coating equipment was rapidly developed to support the industrial production for these types of coatings on components.

Today the focus is on the growing customer demand for coating properties like higher temperature stability and increased wear resistance in combination with low viscosity lubricants and fuels. In the last years therefore development work shifted to the group of hydrogen free DLC coatings like a-C and ta-C coatings.

To industrialize these coatings different developments were carried out in the last years to enable depositing these kinds of coating in an economic way. The equipment design and even the selection of most suitable process technology are however also strongly determined by the productivity and the coating properties. Besides technological properties of the coating there is in the production a large focus on the coating cost per coated part. Reduction of the cost of ownership leads to a tendency to use fast processes in large systems, respectively application of in-line systems. This development gives the opportunity for new fields of application for this type of hydrogen free coatings outside the automotive industry.