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Influence of an Evaporation Process to the Chemical Vapour Deposition (CVD) Synthesis of Diamond.

ABSTRACT - Masterthesis

Diamond coated components have an increasing significance in research and industry of the twenty-first century. This can be attributed to its low friction coefficient and the low wear ratio during dry surface stress, which makes diamond an excellent coating for chipping and sawing tools. New coating technologies also allow the combination of diamond coating with other materials, like multilayer and nano-laminate. However, to deposit these coatings, a combination of sequential deposition process steps is required. Currently no method exists which can produce graded diamond films by the simultaneous application of two coating processes.

The aim of this study is to investigate a new process which allows a simultaneous deposition of solid material during the growth of diamond layers. For that, a layer-based plasma CVD system has to be adopted, in the manner that solid material can be inserted into the plasma flame. It must be clarified if a physical vapor deposition (PVD) of the supplied materials simultaneously to the CVD synthesis is possible and how it influences the CVD process. The used materials will be Titanium or Silicon alloys, in the form of rods and wires. In-situ temperature measurements of the process are carried out through thermocouples, pyrometers and a spectrometer. The subsequent layer analysis is mainly performed by a Raman spectrometer and energy dispersive X-ray spectroscopy (EDX).