

Master 2015

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Adaptation of a Chemical Vapour Deposition (CVD)-Diamond Synthesis to modified Substrate Geometries.

ABSTRACT - Masterthesis

At BIAS - Bremer Institut für angewandte Strahltechnik GmbH a laser based CVD process facility has been developed for the deposition of CVD-diamond layers without the exclusion of the atmosphere. The usage of a 6 kW CO₂-laser enables the ignition and keeping up of an optical pumped plasma within a methane and hydrogen containing argon atmosphere. By choosing adequate process parameters, like the surface temperature and the methane/hydrogen ratio, various diamond layers can be grown epitaxial. The current state of research is that the deposition of diamond layers is done on a flat surface. By the possibility to coat different geometries the application area of the diamond coatings will be increased.

The aim of the master thesis is the research of the diamond deposition of different geometries and to find adequate process parameters for the deposition. As a specific geometry molybdenum balls for tribological ball-on-plate tests should be coated by a diamond layer. If it is possible in the time frame of the master thesis the coating of a forming tool would be possible as another geometry. But the main goal of the master thesis is the diamond coating of the molybdenum balls and the execution of the tribological tests. As samples CVD-diamond layers on molybdenum, amorphous carbon coatings on steel and aluminium plates are used and as counter body Si₃N₄-balls, aluminium-balls and the produced CVD-diamond coated molybdenum balls. With these materials every combination of pairs gets tested and analyzed. In that way the CVD-diamond coating of different geometries as well as the friction and erosion properties of the different pairs of materials will be researched.