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Coating designs for thick cubic boron nitride coatingsSven Ulrich¹, Jian Ye¹, Michael Stüber¹, Carlos Ziebert¹¹Karlsruher Institut für Technologie -KIT, Eggenstein-Leopoldshafen, Germany

sven.ulrich@kit.edu

Improvement of tools and components require high-performance wear resistant surface coatings. In particular for resistant against abrasive wear, superhard materials such as diamond and cubic boron nitride with their outstanding properties are candidates of the best and first choice. In comparison to diamond c-BN shows a better oxidation resistance, thermal stability and chemical inertness with respect to ferrous alloys for temperatures up to 1000 °C. Based on an overview of plasma assisted CVD and PVD process parameters for the synthesis of c-BN, issues of the nucleation and growth of cubic boron nitride coatings and the correlations between stress, c-BN content and mass density are reviewed comprehensively. Unfortunately high c-BN content is always correlated with extreme high compressive stress levels because ion bombardment is up to now invariably necessary for c-BN synthesis. Therefore, several mechanisms were developed for stress reduction without a significant decrease of c-BN content leading finally to highly sophisticated coating concepts, especially based on nanocomposites and nanocrystalline metastable coatings. Finally an overview for the synthesis possibilities of thick c-BN coatings is presented and the challenges for up-scaling are discussed.

Keywords

cubic boron nitride
magnetron sputtering
superhard coatings
nanocomposite
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