HARD COATINGS ON TOOLS FOR WOODWORKING – STATE OF THE ART.

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The machining of wood and wood-derivative materials requires special knowledge on woodworking technology because of their specific properties like: high anisotropy of the material structure, abrupt changes of intrinsic stresses and local hardness (e.g. in laminated materials) and considerable dimensions of machined parts.

The development of tools for cutting of wood and wood-derivative materials ran similarly to the development of cutting tools for metallic materials. Tool steels, used at the early phase of that development, were replaced by high speed steels. Further development of wood industry and increasing share of difficult-to-machine wood materials led to wide use of composite materials, based on sintered carbides WC/Co, and finally on polycrystalline synthetic diamond. Composite carbide materials consist of soft binding phase (Co), responsible for elastic bonding of hard tungsten carbide (WC) particles, which enhance wear resistance of the tool. Machining properties of carbide composite based tools are determined by the share and size of carbide crystallites. Versatility of sintered carbide cutting tools consists in the possibility to shape their mechanical, thermal and chemical properties through the change of their phase composition, grain coarseness and deposition of protective coatings.

Steel tools, despite wide use of hard and super hard materials, are still very popular in wood industry. For example, manufacturing of tools like cutters for wood peeling machines, drills, disposable graded plates, band-saw blades etc., from hard or super hard materials instead of low alloyed steels, high speed steels or stellites would be, because of the required tool geometry, technically impossible or uneconomic. The main advantages of steel materials are: relatively low price and easy manufacturing of tools with complex geometries. The hardness of steel materials reaches 900 HV10. Therefore, surface treatment of tools increasing their load bearing capacity and resistance to abrasive and corrosive wear is in wood industry especially justified both technologically and economically. The research works carried out recently are aimed at development of "a perfect woodworking tool material" that would join high hardness with high ductility and would show good mechanical, tribological and thermo-physical properties (e.g. increased thermal conductivity coefficient), what would bring significant increase in the tool durability.

In the paper the authors present thorough analysis of the state-of the-art in the field of woodworking tools construction, that include both presently used tool materials and presently used surface engineering technologies. In comparison with the achievements of global leaders in the field, the technologies developed so far within national and international projects, carried out by the Institute of Mechatronics, Nanotechnology and Vacuum Technique of the Koszalin University of Technology, as well as the latest research works undertaken by the authors are presented. Besides research results analysis, the main problems that restrain effective cooperation with industrial partners and fast implementation of developed innovative technologies in production practice are discussed.