Abstract

The topography model of cBN active grinding wheel surface taking into account its wear

The thesis concerns the development of the topography model of cBN active grinding wheel surface taking into account its wear. The final and general model involves relations between:

- process adjustable parameters, i.e. grinding speed v_s, depth of grinding a_e, tangential feed v_{ft};
- specific material removal volume V';
- specific grinding force log F_c';
- specific value of an acoustic emission AE';
- selected parameter of a workpiece surface texture (ST) – root mean square gradient *Sdq*;

and representative ST parameters as well as derived parameters which are related to the active grinding wheel surface (AGWS) of electroplated cBN grinding wheel. Those relations take place within the service life of grinding wheel and take into account its wear.

At the beginning of the thesis a literature review is presented. It contains a short characteristics of cBN and single layer grinding wheels with galvanic binder. There are presented the most important results of preceding research concerning grinding with super-hard single layer grinding wheels, with special attention paid to works mentioning wear of those grinding wheels. There are also discussed various methods of investigating of AGWS and, in particular, measuring its texture. Moreover, quantitative parameters used for the description of AGWS are indicated.

In the following chapter the objective, range and hypothesis of the thesis are given. Next, there are described the methodology of research and the analyses of results. Special attention is paid, while describing the methodology of research, to the developed method which enables measurements of AGWS approximately in the same locations on grinding wheel in various stages of its wear. There is also presented an authorial method for determining on measured surface textures of AGWS such a level of binder that it does not depend on the AGWS state and can be used as a reference for cut levels in the analysis of islands and pores.

Next, there are presented the results of introductory investigations concerning, among other things, micro- and macrogeometry of applied electroplated cBN grinding

wheels. There is described the developed method for determining the characteristics of a natural thermocouple applied in research as well as there are briefly presented the results of test grinding using grinding wheel with received specification.

In the following chapter there are presented the quantitative description of observed kinds of wear of cBN grains as well as the selection of parameters sensitive to AGWS wear. Next, there are shown changes concerning, among other things, such important parameters as the undeformed chip thickness, grinding ratio, grinding force, acoustic emission and temperature in the vicinity of grinding area during performed investigations of grinding. That chapter also contains general information concerning the changes of a workpiece surface texture.

The next part of the thesis presents the developed component regression models which take into account, among other things, such variable grinding process adjustable parameters as specific material removal volume, total specific grinding force and selected representative parameters of AGWS ST. There is also presented and discussed the general model of AGWS ST expressed through selected representative AGWS ST parameters and derived parameters reflecting the wear of grinding wheel.

Investigations made within the thesis enabled to draw final conclusions which confirm both the validity of the formulated hypothesis and achieving the objective of the thesis. In the last chapter an extended summary of the thesis is given, the final conclusions as well as the original elements of the thesis are enumerated and directions concerning future research related to problems considered in the thesis are presented.

Publications referenced in the thesis are presented in bibliography containing 281 items. Selected detailed results of investigations are given in tables and figures. They are grouped in 6 appendices. They are referenced in the main part of the thesis. The thesis contains 44 tables and 224 figures. The thesis is written on 306 pages.

Key words: *grinding, cBN, single layer grinding wheels, electroplated grinding wheels, galvanic binder, grinding wheel wear, surface texture, models of grinding*