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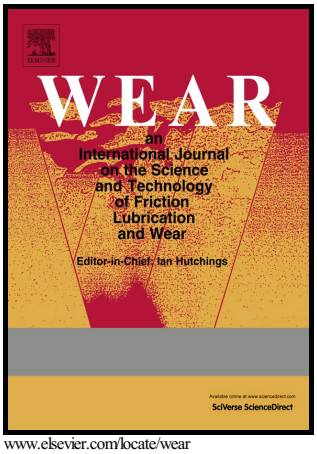

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DYNAMIC IN-PROCESS CHARACTERIZATION METHOD BASED ON ACOUSTIC EMISSION FOR TOPOGRAPHIC ASSESSMENT OF CONVENTIONAL GRINDING WHEELS

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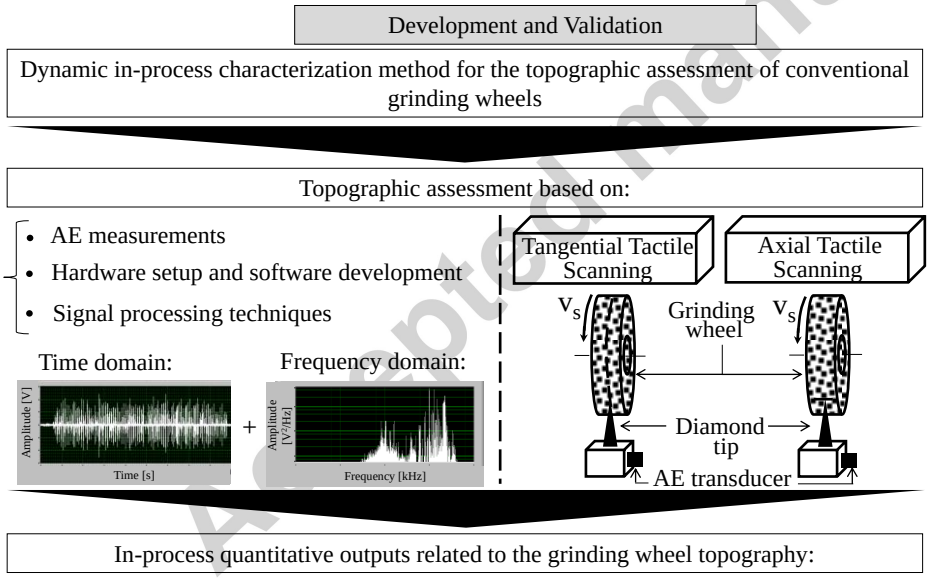
Abstract

The main goal of the present research is to evaluate an acoustic emission (AE)-based quick test-method for in-process determination of the topographic characteristics of a fused aluminum oxide grinding wheel. The in-process evaluation is carried out by scanning the effective width of the grinding wheel with an instrumented diamond tip under interferences in the realm of the elastic deformation range. These contact interferences generate broad frequency AE signals, which are detected by an AE transducer and converted into a proportional electric tension as a time-dependent raw signal, AE_{RAW}. The AE_{RAW} signals are simultaneously transferred to the employed hardware for online conditioning and signal sampling. A software has been developed to extract in-process quantified information from the sampled AE_{RAW} signals. The obtained quantitative information is based on both time and frequency domain analyses, resulting in fast extraction of in-process information related to the grinding wheel topography without stopping the grinding process for post-analyses. The presented method permits obtaining the information of the grinding wheel topography at usual cutting speeds. The validation of the proposed AE-based quick-test method is accomplished through a post-process evaluation of both the grinding cutting force components and the effective roughness of the grinding wheel.

Graphical abstract



Keywords: Cylindrical external plunge grinding, Grinding wheel topography, Process monitoring, Acoustic emission, Signal processing

NOMENCLATURE

AE_{RAW}	V	Acoustic emission raw signal
F_n	N	Normal force
F_t	N	Tangential force
F'_n	N/mm	Specific normal force