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RECENT DEVELOPMENTS IN COATINGS' CHARACTERIZATION FOR FACILITATING THE COATED TOOL LIFE PREDICTION

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Abstract: Coated tools constitute the majority of the tools applied in material removal processes. The paper introduces analytical-experimental methodologies for predicting film properties and cutting performance of coated tools. In a first stage, procedures for calculating stress-strain curves and fatigue critical loads of coatings by nanoindentations and impact tests respectively, at various temperatures determined, are presented. In a further stage, methodologies for the assessment of the film adhesion by inclined impact tests and of the film brittleness by nano-impacts are described. Moreover, the effect of the cutting edge impact duration in milling on the tool performance is demonstrated and explained via impact tests at various force signal times. Finally, the potential of micro-blasting on PVD coatings at appropriate conditions to improve the coated tool life is exhibited. In this context, a tool life increase is associated with the appropriate selection of micro-blasting conditions. The relevant results are evaluated by Finite Elements Method (FEM) supported procedures. The described procedures allow the prediction of coated tool cutting performance and the effective adaptation of the cutting conditions to the film properties, thus restricting the related experimental cost.