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Erosion mechanisms during abrasive waterjet machining: model microstructures and single particle experiments

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Abstract

The erosion mechanisms during abrasive waterjet (AWJ) machining have been examined for a variety of materials. However, no systematic study has considered the effect of the microstructure-property relationship on the erosion mechanisms in metals. In this work, the influence of microstructure and mechanical properties on the erosion mechanisms is investigated using AWJ controlled-depth milling and single particle impact experiments performed on nanocrystalline, microcrystalline and single crystal nickel samples. The resulting footprints and subsurface microstructure evolution were analysed using advanced characterization techniques. The erosion rate of the target metal is found to correlate positively with grain size and negatively with hardness but this correlation is nonlinear. The subsurface microstructure of the single crystal and microcrystalline are altered, while only the texture of the nanocrystalline nickel is modified. The grain refinement mechanism observed

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