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The effect of dressing parameters on micro-grinding of titanium alloy

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Highlights

- For the first time, the effects of dressing parameters on the grinding forces and the surface roughness were investigated.
- The effects of the relatively high dressing overlap ratio (up to 2000) and the dressing speed ratio on the grinding forces and the ground surface were studied.
- The effect of the cutting speed on the surface roughness is also investigated.
- finer surface roughness and higher micro-grinding forces were obtained with the higher dressing overlap ratio.
- When the dressing speed ratio is negative the surface roughness was improved and the grinding forces were increased.
- The lower the dressing overlap ratio and higher dressing speed ratio led to the coarser topography of the micro-grinding pin, resulting more chip loading on the micro-grinding pin surface and some micro-cracks on the ground surface of the workpiece.
- Using lower cutting speed caused finer surface roughness

Abstract

This paper is concerned with investigating the effects of dressing parameters and the effect of the cutting speed on the performance of micro-grinding of titanium Ti-6Al-4V alloy. Extremely high dressing overlap ratios were used for the first time to dress the grinding pins, and the obtained micro-topography, measured on the surface of the pins, is found to be directly related to the grinding forces. More specifically, both the normal and tangential grinding force components increased with the dressing overlap ratio. Related effects of dressing on surface quality are also presented. Grinding with pins containing finer topography was accompanied by less loading with chips and hence a better surface finish. Moreover, down-dressing method generated rougher finished surface quality and induced lower grinding forces compared to the up-dressing. High values of the dressing overlap ratio (up to 1830) in the up-dressing method improved the surface finish significantly.

Keywords: Micro-grinding; Dressing; Grinding pin; Dressing overlap ratio; Dressing speed ratio

1. Introduction