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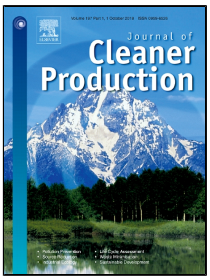

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Experimental characterization on eco-friendly micro-grinding process of titanium alloy using air flow assisted electrospray lubrication with nanofluid

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Abstract: In this paper, a new eco-friendly lubrication technique, which is referred to as the nanofluid air flow assisted electrostatic lubrication (AF-ESL), has been proposed and applied to the micro-grinding process of titanium alloy. In the nanofluid AF-ESL technique, nanofluid droplets can be injected into the grinding region by being driven by an electro-hydro-dynamic force and pressurized air flow. For the experimental performance evaluation, a series of micro-grinding experiments are designed and conducted by varying a size and a weight concentration of nanodiamond particles in the nanofluid. It is demonstrated that the nanofluid AF-ESL can significantly reduce the resultant grinding forces and grinding force ratios. It is also shown that the nanofluid AF-ESL improves the surface quality of ground workpiece and grinding tool condition significantly. In particular, larger nanodiamond particles (80 nm) are more advantageous for enhancing the nanofluid AF-ESL micro-grinding performances. In addition, a weight concentration of nanodiamond particles in the nanofluid is another important factor to influence on the micro-grinding performances.

Key words: Eco-friendly micro-grinding, Titanium alloy, Air flow assisted electrospray lubrication (AF-ESL), Nanofluid