

Effects of chatter on workpiece surface topography during diamond turning

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During diamond turning of difficult-to-cut materials, a kind of self-excited vibration named chatter may occur mainly due to the regenerative effect. It usually leads to large cutting forces and vibrations of the workpiece/cutting tool, resulting in inferior workpieces and short tool lives. Thus, chatter phenomenon is analyzed for the ultra-precision diamond turning process in this study. Based on the regenerative effect, the turning force is modeled by considering the effect of chatter. The diamond turning experiment of titanium alloy is then carried out. The results on the measured cutting forces and the machined surface of the workpiece show that chatter not only affects the surface roughness (S_a and S_z) of the workpiece, but also changes the surface pattern.
