# Effects of grain size on removal mechanism of britt le polycrystalline materials in laser assisted diamo nd turning

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KEYWORDS: Machining mechanism, Laser assisted turning, Grain size, Numerical simulation

*The nano-cutting performance of brittle polycrystalline materials is greatly influenced by their grain size. In the pr esent work, a finite element model of laser assisted diamond turning of polycrystalline tungsten carbide (WC) was developed, aiming to evaluate the influence of grain size on the material deformation and removal mechanism in l aser assisted diamond turning. The thermal effect of laser in-situ radiation on the workpiece is implemented in a user subroutine (VDFLUX), and a modified Johnson-Cook constitutive model is adopted to accurately describe mat erial plastic response under elevated temperature. The simulation results show that the grain boundary density and intergranular bonding strength decrease significantly with the increase of grain size. Therefore, cutting energy ca nnot be absorbed through material plastic deformation and tends to be released through intergranular fractures, c ausing grain spalling on the machined surface. Thermal softening effect of laser can reduce the grain spalling by reducing the grain strength, but it still cannot be avoided, thereby compromising the finish surface integrity inevita bly.*

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Word count: 162 words