Simulation of Ceramic Grinding Process Based on Discrete Element

Method

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Abstract

The grinding mechanism is the base of developing new precision machining technology, especially for brittle materials including ceramics. In previous work, many results are derived from single grit cutting model in which a grit contact continuously with workpiece, such as indentation or scratching process, to model the material remove of grinding. However, the abrasives are distributed randomly on the surface of grinding wheel, and they will impact the workpiece periodically in grinding process. In this study, the discrete element method was introduced to simulate the mechanics behavior of Al₂O₃ ceramic through parameters calibration process. The model was validated by the simulation of indentation test. Assuming the abrasives are unbroken, the grinding processes simulation were carried out under various conditions with different machining parameters such as velocities and cutting depths. The fracture initiation and material remove rate were investigated. The results were compared with those gained from single grit model. It shows that we should pay close attention to the mutigrit model to explore the grinding mechanism, and concentrate the cracks initiation & propogation.

Keywords: Discrete element method, simulation, ceramics, grinding.

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