

The relationship between grinding energy and particle characteristics by DEM simulation

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Abstract

Grinding energy is one of the most important parameters of the grinding process. We investigated grinding energy in the ball milling process using a discrete element method (DEM) simulation. A simulation of the three-dimensional motion of balls in a traditional ball mill and planetary ball mill for the research of grinding mechanism has been carried out by DEM simulation. The effect of operational variables such as rotational speed, ball material, and size on flow velocity, collision force, and total impact energy was analyzed. Also, we explored the relationship between grinding energy and change of particle characteristics in the ball milling process by DEM simulation. Experiments were conducted to quantify grinding performance under the same conditions. And we found grinding energy from estimated results of simulation via a DEM simulation with actual experiment. These results may be helpful in grinding energy consumption.

Keywords: Grinding energy, DEM simulation, Ball milling process, Traditional ball mill, Planetary ball mill