

## 高速精密磨削9CrWMn冷作模具钢的磨削力和比磨削能

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## Grinding force and specific grinding energy of high speed grinding of 9CrWMn cold work die steel

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摘要

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**摘要** 分析了高速精密磨削9CrWMn冷作模具钢的机理,采用DEFORM软件对高速磨削模具钢9CrWMn过程进行了磨削力仿真。使用高精度高速平面磨床对模具钢9CrWMn进行了高速精密磨削试验,并在线测量了多种工况下的磨削力。结果表明:在其他两组工艺参数不变时,随着工件进给速度增加,磨削力特别是法向磨削力会增大近45%;法向磨削力和切向磨削力随着砂轮的线速度上升而下降,法向磨削力下降近33%;磨削深度对磨削力影响较大,大的磨削深度对法向磨削力的影响尤其显著,可使法向磨削力增大近100%。分析了磨削工艺参数对比磨削能的影响规律,结果显示:随着磨削深度和工件进给速度的增大,比磨削能呈比较明显的下降趋势,符合磨削加工中的尺寸效应;随着砂轮线速度的增大,比磨削能呈上升趋势。最后,对高速磨削前后工件表面的微观形貌进行了对比分析,磨削力试验结果和仿真理论分析相一致。

**关键词** : 高速磨削, 冷作模具钢9CrWMn, 磨削力, 比磨削能, 在线测量

**Abstract** : The high speed grinding mechanism for 9CrWMn cold work die steel was analyzed, and DEFORM software was used to simulate the grinding force in high speed grinding processing of 9CrWMn cold work die steel. A series of high speed grinding experiments were conducted on a Computer Numerical Control(CNC) high speed grinding machine (BLOHM PROFIMAT MT-408) to measure grinding forces on line under different working conditions. It demonstrates that as the workpiece feed rate increases, the grinding forces especially the normal force increase nearly 45%. Both normal and tangential forces decrease with going up the wheel velocity and the normal force decreases nearly 33%. The cut depth has a larger effect on the grinding forces, especially the normal grinding force increases nearly 100%. The influence of processing parameters on the specific grinding energy was investigated. It shows that with increasing grinding depth and workpiece feed rate, specific grinding energy decreases obviously, in accordance with the size effect in grinding process. Moreover, with increasing the wheel velocity, the specific grinding energy increases. At last, the microtopographies of a workpiece surface before and after high speed grinding were compared. The experimental results are well consistent with simulation analysis results.

**Key words** : high speed grinding cold work die steel 9CrWMn grinding force specific grinding energy measurement on line

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