

磁粒研磨加工技术的研究进展

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摘要: 磁粒研磨加工是一种应用广泛且高效的表面加工技术, 具有加工质量高、适用范围广、柔性加工、自锐性好、易于实现自动化等优点, 能够有效去除工件表面的划痕、积碳、毛刺和卷边等缺陷。首先, 综述了磁粒研磨加工技术的发展与研究, 包括磁粒研磨加工技术的提出与发展、数学模型分析和加工参数产生的影响, 其中着重论述了加工过程中单颗磨粒的力学模型建立以及铁磁相和研磨相的配比问题, 并且从磁极形状、磁极转速、加工间隙和磨料性能四个方面分析了加工参数对研磨过程的影响。然后, 分类介绍了磁粒研磨加工技术应用于平面、圆柱外表面和圆柱内表面时的加工原理, 并对其加工特点进行了总结。归纳了几种磁粒研磨加工技术的发展方向, 包括电磁磁粒研磨加工、超声辅助磁粒研磨加工、化学辅助磁粒研磨加工和电化学辅助磁粒研磨加工, 对这几种新型复合加工方法的加工原理以及所能达到的实验效果进行了介绍, 并评述了其各自的加工特点。最后, 提出了当今磁粒研磨加工技术研究中存在的一些缺陷, 并对其未来的发展趋势进行了展望。

关键词: 磁粒研磨; 表面粗糙度; 电磁磁粒研磨; 超声辅助磁粒研磨; 电化学辅助磁粒研磨

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Research Progress of Magnetic Abrasive Finishing Technology

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ABSTRACT: Magnetic abrasive finishing technology is a widely used and efficient surface processing technology. It has the advantages of high machining quality, wide application range, flexible machining, good self-sharpening, and easy to realize automation. It can effectively remove defects such as scratches, carbon deposition, burrs, and curling on the workpiece surface. Firstly, the development and research of magnetic abrasive finishing technology were summarized, including the proposal and development of the technology, the analysis of the mathematical model, and the influence of processing parameters. The establishment of mechanical model of single abrasive particle and the ratio of ferromagnetic phase to abrasive phase in the

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