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基于灰关联理论的磁力研磨工艺参数优化

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摘要：采用田口正交法进行试验设计，探究了磁针型号、磁极盘转速和加工磁间距和加工时间对工件表面粗糙度、表面硬度和工件材料去除量的影响。用灰度关联理论法分析实验数据，并计算灰关联系数和灰关联度，得出最佳工艺参数。当磁针型号为ϕ 0.5 mm×5 mm，磁极盘转速为2000 r/min，加工磁间距为10 mm，加工时间为30 min时，试验效果最佳。单个工艺参数中，与试验结果关联度最高的是磁针型号，其次是加工时间和加工磁间距，而影响程度最小的是磁极盘转速。经试验验证，在优化后的工艺参数下，各项性能指标，包括工件表面粗糙度、表面硬度和工件材料去除量，均为最佳。

关键词：磁力研磨；表面质量；多性能指标；灰关联度；参数优化
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Optimization of Magnetic Needle Grinding Process Parameters Based on Gray Correlation Theory

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Abstract: Taguchi orthogonal method was used to carry out experimental design to explore the influence of magnetic needle type, rotating speed of magnetic pole plate, machining magnetic gap and machining time on workpiece surface roughness, surface hardness and workpiece material removal. The experimental data were analyzed by gray correlation theory method, and the gray correlation coefficient and gray correlation degree were calculated to obtain the best technological parameters. When the model of the magnetic needle was ϕ 0.5 mm× 5 mm, the rotating speed of the magnetic pole plate was 2000 r/min, the processing magnetic spacing was 10 mm, and the processing time was 30 min, the test result was the best. Among the single process parameters, the type of magnetic needle had the highest correlation with the test results, followed by the processing time and processing magnetic spacing, while the rotation speed of the magnetic pole disk had the least influence. The experimental results showed that under the optimized process parameters, various performance indexes were the best, including workpiece surface roughness, surface hardness and workpiece material removal.

Keywords: magnetic grinding; surface quality; multi-index; gray correlation degree; parameters optimization

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