

中文摘要

微孔放電加工對微細元件及高硬度、高強度等難加工材料，具有十分優越之加工特性。然加工過程中加工表面因急熱驟冷作用容易產生微裂紋、氣孔等缺陷，對加工表面品質造成嚴重的影響。

本文係以高降伏鋼（HY-80）進行微孔放電加工，並對加工後之材料移除率、電極消耗比、擴孔量進行研究，並探討放電條件與加工特性品質之關係。

藉由實驗分析得知，其材料移除率與擴孔量會隨放電電流與放電持續時間增加而增加。利用掃描式電子顯微鏡觀測高降伏鋼經由微孔放電後之進口段、中段及出口段表面形貌之變化，並可明顯發現當放電電流增加將使放電痕逐漸變深、變大。而隨著放電持續時間增加，放電痕面積隨之增大，淺坑與痘瘡高度則變淺。於表面裂紋觀察時發現，當放電電流較小時，裂紋數量較少，隨著放電電流增加，裂紋數量更為減少。

英文摘要

Micro-hole electrical discharge machining (Micro-hole EDM) has advantageous characteristics of machining for micro-components and difficult cutting materials with high hardness and high strength. However, because the effect of rapidly heating and fast cooling during the period of machining, the defects, such as micro-cracks, gas holes...etc., was easy to be induced serious influences for machined surface quality. In this study, the high yielding steel(HY-80) was employed to proceeding micro-hole electrical discharge machining and the material removal rate (MRR), electrode removal ratio(ERR), hole-enlargement(HE), surface morphology were investigated. And the relationship between machining parameters and machining characteristics was studied.

Based on the results of experimental analysis, the pulse current and duration on time increase the MRR and HE will increase. The SEM was used to observe the change of surface topography for high yielding steel of inlet region, middle region, and outlet region after EDM. And when the pulse current was increased, the deeper and bigger EDM craters were found and the height of EDM crater was decreased. The duration on time was increased, the area of EDM crater was increased and the height of crater and pockmark were decreased. Observing the surface crack, we found the less of pulse current, the fewer of the crack. And the pulse current was increased, the number of crack was getting fewer.