Modelling of Geometric Features of Micro-Channel Made using Abrasive Assisted Electrochemical Jet Machining

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Geometric features of micro-channel can significantly affect heat transfer rate or fluid mixing rate in applications where the micro-channels are functioning. Abrasive assisted electrochemical jet machining (AECJM) can machine complex micro-channels at metals with low-cost, high efficiency and good surface quality. This study presented a method for predicting channel width and channel depth machined using AECJM process. Two different models, namely quadratic polynomial model and dimensional analysis model, for predicting width and depth of micro-channel due to AECJM were developed and investigated. The result shows that the dimensional analysis model has more stable predictability than quadratic polynomial model. Jet diameter is the dominant factor affecting the channel width, while working voltage and machining time are main factors influencing the channel depth. The inter-relationship between channel width and channel depth can be expressed using presented predictive models. Afterwards, micro-channel with desired width and depth can be achieved through the inter-relationship and present models.

Keywords: micro-channel; geometric features; abrasive assisted electrochemical jet machining; electrochemical jet machining; abrasive water jet machining

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