<<第16届国际电加工会议论文集>>

图书基本信息

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作者：赵万生，叶军，朱荻 编

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前言

The International Symposium on Electromachining （ISEM） is a triennial meeting of academia and industry that specializesin electro-physical and electro-chemical machining. This event is conducted under the auspices of the InternationalAcademy for Production Engineering （previously known as International Institution for Production Engineering Researchand also CIRP, from the French name Collige International pour la Recherche en Productique' ）. It serves as a platformfor the dissemination of the latest scientific and technological accomplishments that represent the state-of-the-art innontraditional machining processes. The ever increasing diversity of the geographical locations of participants and the widerspectrum of topics covered since the beginning of ISEM in 1960's is a testimony of the growing success and popularity ofthis international symposium.The 16th International Symposium on Electromachining （ISEM XVl） is held in Shanghai China, just 11 days before theWorld EXPO 2010. Situated in the Yangtze River Delta on China's eastern coast, Shanghai is renowned as the mostinternationalized metropolitan city in China. Shanghai has given the birth to China's modem industry, and witnessed thegreat changes in China's modern history. Over thirty years of economic reform, Shanghai has metamorphosed into aeconomic power house in China. The city as a whole is on the way towards an international center for finance, logisticsand transformation which is expected to be accomplished by the year 2020.

内容概要

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书籍目录

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章节摘录

插图：The EDM process has been used in industry for decades,and it is, by far, the most common amongst the non-conventional machining processes. Its applications covera variety of industries such as mould and tool making,automotive medical and micromechanics. In spite of thementioned popularity of this process, its use has beenlargely based on empirical knowledge and on theexperience of EDM machine users. As a result, accuratepredictions of material removal rate, surface finish andsurface integrity have only been achieved after costly trial-error approaches. The existing lack of scientific knowledgecan be attributed to two main reasons: First, there existgreat difficulties when it comes to experimentallymeasuring magnitudes related to the discharge process;second, EDM involves several physical phenomena,including thermal, electrical, mechanical and metallurgicalprocesses.Determining the complex relationshipsamongst parameters is a difficult task, and makesmodelling of EDM a challenge.In recent years, efforts have been put on modelling of the process, both numerical and analytical I. As saidbefore, during the discharge process effects of verydistinct nature merge together, but it is commonlyaccepted that the thermal effect is the most important ofthem 2101, being other aspects such as the electricalforces less significant when it comes to the materialremoval mechanism. This is why thermal modelling ofEDM is one promising alternative, since a deepknowledge of the mechanisms involved in this process canbe acquired. If the discharge channel formed duringerosion, together with the material ejection are adequatelyrepresented by a thermal model, it will be possible tomake predictions of the material removal rate, surfacefinish and surface integrity, but it is at this point whendifficulties concerning the experimental characterization ofthe discharge process arise. The dispersion found inpublished models suggests that more researchhas to be carried out on this field.No doubt, the validity of thermal modelling tool relies onthe similarity between the modelled heat source and theactual discharge process. In this sense, special care hasto be taken when defining the heat input, and also whendetermining the discharge location criteria. In literature,two approaches to simulation can be found, one is centredin solving the thermal problem associated to the erosioncaused by a single discharge E 1 - 81, and the other isfocussed on the discharge location algorithm, as a tool forpredicting the shape of both workpiece and electrode afteran EDM operation The main drawbacks concerning thermal simulation ofsingle discharges are related to the fact that processconditions when carrying out single discharge experimentsdiffer substantially from those occurring during continuousEDM. Three are the arguments to consider that thosesituations have relevant differences. The first of them isthat single discharge experiments are performed onworkpieces whose surfaces do not show the roughnessprofiles characteristic of EDM-ed surfaces. The absenceof those irregularities may have effect on the dischargeprocess as well as on the material removal mechanism.The second reason is the presence of gas bubbles in theinterelectrode gap. Some researches reveal that a bigpercentage of the gap volume is filled with bubbles afterthe first instants of erosion, and that discharges developedin a gaseous medium differ from those that take place inliquid dielectric And finally, the third argumentto consider is the effect that the debris generated duringerosion has on the process. This debris reduces theinsulating properties of the dielectric medium and thereforeinfluences the discharge generation mechanism andlocation. It also increases the gap width, which affects thegeometrical precision of the manufactured pieces. On theother hand, those models focussed on the evolution of thegeometries of both workpiece and electrode during EDMoperations, through simulation of discharge locationalgorithms give useful information about process featuresat macroscopic scale, but cannot deal with the generationof surface roughness profiles, nor with the thermallyinduced damages, such as white layer formation, heataffected zones, residual stresses or microcrack formation.As previously mentioned, when developing a thermalmodel of EDM, the definition of discharge characteristicsmust be as realistic as possible, in order to obtain resultsthat can reflect the process outputs accurately. Thesecharacteristics can be summarized in three parameters:the amount of energy involved in the heating of theworkpiece material, growth law and size of the plasmachannel, and the material ejection mechanism.

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