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Experimental study on conductivity versus concentration of electrolytes for electrochemical deburring process

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Statement of the Problem: Electrochemical deburring (ECD) is a widely popular process among industries to manufacture miniature parts and intricate components. Hence, it is important to optimize its process parameters to obtain high material removal rates and cost efficiencies. The domain of this paper focuses on the electrolyte types and control over the variation of its concentration during ECD operations. Here, a technique is developed to maintain a set value of electrolyte concentration based on its relation with the electrical conductivity of electrolytes.

Methodology & Theoretical Orientation: Sample testing solutions were prepared in laboratory for the electrolytes, sodium chloride and sodium nitrate. Conductivity and total dissolved solids (TDS) measurements were taken for each sample and recorded. Standard conductivity and TDS versus concentration charts were prepared corresponding to the measurements. Then the charts are trend-fitted to obtain certain empirical relations for the concerned parameters. These relations are then used to identify the value of conductivity by substituting the desired amount of concentration.

Conclusion & Significance: The measured values of conductivity and TDS for various concentrations of sodium chloride and sodium nitrate show a proportionate growth with respect to the concentrations. The interpolation models obtained from the plots can be utilized in industrial ECD operations to control and manipulate concentration of electrolytes. As it is a difficult task to maintain a set value of concentration in such applications, this technique can simplify it by monitoring the corresponding value of conductivity for the required concentration.

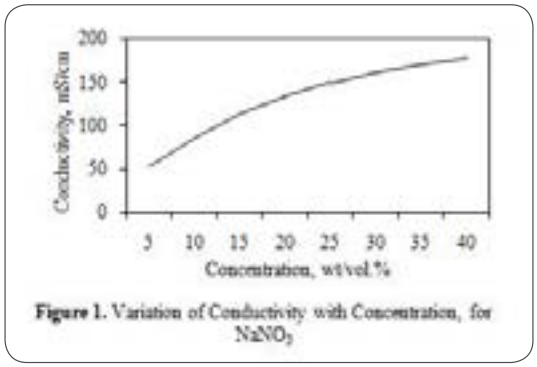

Figure 1. Variation of Conductivity with Concentration, for $NaNO_3$

Recent Publications:

1. B Bhattacharyya and J Munda (2003) Experimental investigation on the influence of electrochemical machining parameters on machining rate and accuracy in micromachining domain. International Journal of Machine Tools & Manufacture 43:1301–1310.
2. B Bhattacharyya, J Munda and M Malapati (2004) Advancement in electrochemical micro-machining. International Journal of Machine Tools & Manufacture 44:1577–1589.
3. K P Rajurkar, D Zhu, J A McGeough, J Kozak and A De Silva (1999) New Developments in Electro-Chemical Machining. CIRP Annals 48(2):567-579.
4. Atkins P W and de Paula J (2006) Physical Chemistry (8th ed.), Oxford University Press, ISBN 0198700725.
5. S K Sorkhel and B Bhattacharyya (1994) Parametric control for optimal quality of the workpiece surface in ECM. Journal of Materials Processing Technology 40:271-286 271

Biography

Alay Patel is pursuing his graduation in Mechanical Engineering at Pandit Deendayal Petroleum University, Gandhinagar, Gujarat, India. He has been appointed as an Undergraduate Research Assistant to a PhD scholar and has been working on the topic of Electrochemical Deburring for the past two and half years. Based on his passion and the opportunities provided at the institution, he has gained a good amount of knowledge base and research experience in manufacturing division of mechanical engineering. Other than that, he had participated in an industrial innovation competition organized by Larsen & Toubro (L&T) Technological Services, in which he secured a position in top 20 participants out of 7000, at the national level

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