

# Characteristics of low concentrated nickel sulphamate electrolyte for electroforming applications

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The performance of low concentration nickel sulphamate electrolyte at three different concentrations of nickel is reported. Data from Hull Cell, Haring and Blum Cell, current efficiency and conductivity measurements are presented.

**Key words:** Nickel sulphamate bath, nickel deposition, electroforming

## INTRODUCTION

In recent years, low concentrated plating electrolytes are widely employed, as they offer less cost on chemicals, less dragout loss and high throwing power in comparison with the conventional plating solutions [1-3]. The control of current distribution to yield a metal coating as nearly uniform in thickness as possible is a fundamental problem common to all electroplaters. In the present study the authors report on the development of high throw nickel sulphamate electrolytes for electroforming applications.

## EXPERIMENTAL

The electrolyte was prepared from laboratory reagent grade chemicals. Nickel sulphamate was prepared using standard procedures, purified, dummied and preconditioned. The solutions were made up to have the following compositions.

	O	A	B
Nickel sulphamate	240 g/l	125 g/l	70 g/l
Nickel chloride	15 g/l	15 g/l	15 g/l
Boric acid	40 g/l	40 g/l	40 g/l

The pH of the solutions was adjusted to a value between 3.8 and 4.2 and the following studies were made using established procedures:

Hull cell studies  
Haring-Blum cell throwing power studies  
Current efficiency studies and conductivity measurements

## RESULTS AND DISCUSSION

Hull cell studies indicated the occurrence of quality deposits from the low concentrated baths. Hence the low

concentrated baths appear promising for electroforming applications.

Current efficiency studies indicated that for the low concentrated baths current efficiency falls with increasing current density. Hence higher throwing power is expected from low concentrated bath, as the current efficiency is less at the high current density areas.

Throwing power and conductivity measurements gave the following values:

	Throwing power	Conductivity
Solution O	16.0 %	65 m.mhos
Solution A	24.6 %	47 m.mhos
Solution B	14.8 %	32 m.mhos

Solution A gave higher value of throwing power.

## CONCLUSION

Characterisation of the low concentrated baths showed that the following electrolyte exhibited good throwing power : nickel sulphamate 125 g/l, nickel chloride 15 g/l and boric acid 40 g/l. The improved throwing power and thereby the good metal distribution is attributed to fall in current efficiency at high current density areas.

## REFERENCES

1. B F Rothchild, *Plating Sur Finish*, **66-5** (1979) 70
2. N V Shanmugam, S John, K N Srinivasan, M Selvam and B A Shenoji, *Proc Second Int Symp Ind Oriented Basic Electrochem, SAEEST, India*, (1980) 6.1
3. F Hasko and P Bujtas, *Trans Inst Metal Finish*, **54** (1976) 35