

**CORROSION BEHAVIOR OF SPUTTER- DEPOSITED W-  
Cr-(4-15)Ni ALLOYS IN NaCl AND NaOH SOLUTIONS**

**a Dissertation**

Submitted to the Central Department of Chemistry

in Partial Fulfillment of the Requirement for

M. Sc. Degree in Chemistry

By

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***LETTER OF ACCEPTANCE***

M. Sc. dissertation entitled "**CORROSION BEHAVIOR OF SPUTTER-DEPOSITED W-Cr-(4-15)Ni ALLOYS IN NaCl AND NaOH SOLUTIONS**" submitted by *Mr. Pom Lal Kharel* has been accepted as a partial fulfillment of the requirement for M. Sc. Degree in Chemistry.

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## FOREWORD

*Mr. Pom Lal Kharel* has carried out the entire work presented in this thesis under my supervision in the academic year 2004- 2005. During the research period, he has performed the work sincerely and satisfactorily. No part of this thesis has been submitted for any other degree.

.....

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## ABSTRACT

The synergistic effect of chromium addition in the sputter-deposited amorphous or nanocrystalline W-Cr-(4-15)Ni alloys is studied in 0.5 M NaCl and alkaline NaOH solutions at 25°C, open to air using immersion tests and electrochemical measurements. In 0.5 M NaCl solution, the addition of chromium to W-Cr-(4-15)Ni alloys containing 42-75 at % chromium increases the corrosion resistance and makes the open circuit potential more noble so as to show higher corrosion resistance than those of alloy-constituting elements (that is, tungsten, chromium and nickel). The corrosion rates of all the examined W-Cr-(4-15)Ni alloys are almost same (that is, about  $2-3 \times 10^{-3}$  mm/y) and are about one order of magnitude lower than that of tungsten and even lower than that of chromium metal after prolonged immersion in 0.5 M NaCl solution. In 1 M NaOH solution, the corrosion rates of the W-Cr-(4-15)Ni alloys (about  $2-5 \times 10^{-3}$  mm/y) are about two orders of magnitude lower than that of tungsten and nearly one order of magnitude lower than that of chromium metal. The open circuit potential of the W-Cr-(4-15)Ni alloys is generally increased with increasing chromium content in different concentrations of NaOH solutions. The open circuit potentials of all the examined W-Cr-(4-15)Ni alloys are in more noble direction in 0.5 M NaCl solution than that in 1 M NaOH solution. The passivity of the W-Cr-(4-15)Ni alloys is increased with decreasing the concentration of NaOH solutions at 25°C.

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