

**UNIVERSITY OF MACAU  
FACULTY OF SCIENCE AND TECHNOLOGY  
DEPARTMENT of  
ELECTROMECHANICAL ENGINEERING**

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**“Research Topics Concerning  
Stainless Steels:**

- (1) Factor Affecting Corrosion Behavior of  
Weldment of S30400 Stainless Steel  
in Cold Region**
- (2) Effect of Nitrogen and Delta-Ferrite  
Contents on Mechanical Properties,  
Corrosion Resistance and Abrasive Wear in  
Type S30400 Stainless Cast Steel”**

by

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**Date : 01/07/2010 (THURSDAY)**  
**Time : 15:00 – 17:00**  
**Venue : HG01**

## **Abstract**

### **(1) Factor Affecting Corrosion Behavior of Weldment of S30400 Stainless Steel in Cold Region**

In the fishery fields, the manufacturing machines and equipments consist of weld parts using Type S30400 stainless steels. Moreover in the cold region, those suffer severe corrosion from freezing and thawing. In this research, the study was carried out to investigate the factor affecting on the corrosion behavior of S30400 stainless steel weldment by means of FeCl<sub>3</sub> immersion test and precision potentiostatic polarization ( volutammetric ) method. After immersion test at freezing and thawing cyclic condition the severe corrosion damage was detected in the vicinity of weld boundary more than isothermal condition. The corrosion damaged zone corresponds to the location in which there are high residual stress and sensitization. The influence of residual stress and sensitization was distinguished and its magnitude was evaluated by volutammetric method.

### **(2) Effect of Nitrogen and Delta-Ferrite Contents on Mechanical Properties, Corrosion Resistance and Abrasive Wear in Type S30400 Stainless Cast Steel**

The microstructural features and mechanical properties of Type S30400 stainless cast steels were correlated with nitrogen contents together with the varying concentrations of nickel and other compositions. Delta-ferrite contents varied with the composition, however, showing relatively lower contents than those predicted by DeLong plot. Regression equations were developed among various properties. Tensile strength and abrasive wear also linearly related to the hardness. Electrochemical measurements showed that the varying chemical compositions and delta-ferrite contents have only a minor effect on the corrosion resistance. Multiple regression analysis was made to explain the contribution of nitrogen and delta-ferrite, which satisfactorily predicted the yield strength, tensile strength, impact energy and abrasive wear. It was shown that nitrogen causes well-known strengthening effect, and also delta-ferrite is a powerful strengthening element.

## **Biography**

Prof. Yoshitaka Iwabuchi was born and raised in Hokkaido, Japan. He received his PhD degree in Materials Science from Hokkaido University in 1985 and then he worked in Japan Steel Works Ltd for more than 15 years. After that, he joined the Kushiro National College of Technology as the Professor in Department of Mechanical Engineering and he is also the Vice-President of the College and the Director of Cooperative Technology Center. Prof. Iwabuchi has strong background in Materials Science and extensive experience in steel manufacturing. His research interests include improvement of structural materials, recycling and reuse of industrial wastes, development of advanced heat-resisting materials, and fundamental study on corrosion behavior of various steels.

**ALL ARE WELCOME!**