EFFECT OF NITROGEN CONTENT IN ARGON SHIELDING AND BACKING GASES ON PROPERTIES OF SIMILAR AND DISSIMILAR WELD OF S31050 AND S32906 UREA GRADE STAINLESS STEEL

By

Ali Ahmed Ali Elashery

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
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In
METALLURGICAL ENGINEERING

FACULTY OF ENGINEERING, CAIRO UNIVERSITY

GIZA, EGYPT

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Title of Thesis: EFFECT OF NITROGEN CONTENT IN SHIELDING GASE ON PROPERTIES OF WELDMENTS OF S31050 AND S32906 STAINLESS STEEL

Key Words

Super duplex; nitrogen; shielding gas; urea; fully austenitic

Summary: This research aimed at investigating the effect of shielding and backing gases composition by supplementing nitrogen compared to usage of pure argon on: **(i)** microstructure of similar and dissimilar stainless steel root weld and phase balance within the weld regions; **(ii)** mechanical properties of the root weld zone in terms of amount of impact toughness and Vicker's hardness; **(iii)** ferrite Content measurement; **(iv)** susceptibility to crevice corrosion in terms of mass losses. It was found that adding nitrogen to argon in the composition of the shielding/backing gases in welding the root passes by gas tungsten arc welding process significantly increase the heat input and weld nitrogen content for both S32906 and S31050. It is also found that adding nitrogen improves the weld mechanical characteristics, phase balancing and noticeably enhances the corrosion resistance of the dissimilar weldment. An increase in the nitrogen content significantly decreases the degree of chromium partitioning but has a lesser effect on nickel and molybdenum. Furthermore, based on the desirable limits of ferrite content, the recommended addition of nitrogen to argon shielding gas is 10% maximum for similar S32906 joints and 2 % for dissimilar S31050/S32906 joint.

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TO THE MEMORY OF MY MOTHER

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