



**INFLUENCE OF N₂ ADDITIONS TO AR SHIELDING
GAS ON PROPERTIES OF SIMILAR AND
DISSIMILAR WELDS OF DUPLEX AND AUSTENITIC
STAINLESS STEELS
2507, 2906 AND 25 22 2**

By

Mohammed Attallah Mahmoud Ahmed EL- Kholy

**A thesis submitted to the
Faculty of Engineering at Cairo University
in partial Fulfillment of the
Requirements for the Degree of
Doctor of Philosophy
in
METALLURGICAL ENGINEERING**

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GIZA, EGYPT

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Title of Thesis: Influence of N₂ additions to Ar shielding gas on properties of similar and dissimilar welds of duplex and austenitic stainless steels 2507, 2906 and 25 22 2

Key Words Hyper duplex, Super duplex, Nitrogen, argon, urea grade,



Summary: Duplex stainless steels are alloys consisting of a two phase microstructure with a balance between ferrite and austenite. They combine good corrosion properties, high yield strength. In many industrial projects the need for joining two different metals by welding is required. Hyper duplex stainless steel HDSS 2906, Super duplex stainless steel SDSS 2507 and austenitic stainless steel ASS 25 22 2 were the main three alloys used in this study.

In the present work different nitrogen concentrations, (0, 2, 5, 10, and 100 % N₂) for HDSS to itself and to ASS, while three different nitrogen concentrations (0, 2, 100%) for SDSS to itself and to ASS. The influence of mentioned gases with different nitrogen concentration on the mechanical properties, macro/microstructure and corrosion resistance were studied. In addition the influence of shielding gases on chemical weld metal was tested. Additionally SEM/ EDX were done to study the phase balance and element partitioning. It is found that adding nitrogen to shielding gas improve mechanical properties, the increasing of nitrogen also increase heat input and peak temperature. The ferrite percent were significantly decreased by increasing nitrogen. The increase of nitrogen improves corrosion resistance and has a great effect on the element partitioning in austenite and ferrite phases. An increase in the nitrogen content was significantly lowering the degree of chromium partitioning. The recommended addition of nitrogen to argon shielding gas is 10% maximum for similar 2906 and 5 % for SDSS 2507 joints while 2 % N₂ for both dissimilar between ASS 25 22 2 to SDSS 2507 and HDSS 2906 was recommended.

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DEDICATION

To my Family

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