

MICROSTRUCTURAL AND MECHANICAL STUDY OF AN AZ31 MAGNESIUM ALLOY WELD BY THE TIG PROCESS

ABSTRACT

The weldability of magnesium alloys is an important field for research useful in industrial applications. The arc welding process with refractory electrode (tungsten) under an inert atmosphere (TIG) is one of the interesting techniques for producing high quality welds. The purpose of this work is to study the microstructural evolution of the different zones (ZF-ZAT-MB) of welded joints and their consequences on mechanical properties by microhardness measurements and tensile tests on the magnesium alloy AZ 31.

Keywords: *Weldability, Magnesium, Microstructure, TIG Processing, Mechanical properties.*

INTRODUCTION

Magnesium alloys are one of the lightest materials selected in different industries [1][2] in particular the aircraft and aerospace industry, it allows a weight reduction of 25 to 30% compared to aluminum alloys [...]. The difficulty of welding these alloys is due to several parameters such as chaut cracking, oxide layer barrier (MgO), hydrogen blowouts... etc [3] which leads researchers to study it and improve their properties.

Some of the most widely used in arc welding techniques, the MIG (Metal Inert Gas), TIG (Tungsten Inert Gas) process, and recently laser and FSW (friction stir welding) techniques [...]. In this work, we used the arc welding process TIG (Tungsten Inert Gas) with alternating current; this process is based on the arc established between the tungsten electrode and the part to be welded with an alternating polarity (Figure 1) under protection of an inert gas (argon) from the weld pool.

The parameters of this process are defined in the welding energy formula as follows:

