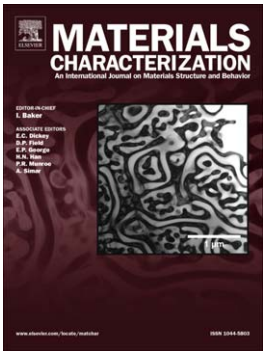

Characterization of Low Alloy Ferritic Steel-Ni Base Alloy Dissimilar Metal Weld Interface by SPM Techniques, SEM/EDS, TEM/EDS and SVET

Siyan Wang, Jie Ding, Hongliang Ming, Zhiming Zhang, Jianqiu Wang

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Siyan Wang, Jie Ding, Hongliang Ming, Zhiming Zhang, Jianqiu Wang*

Key Laboratory of Nuclear Materials and Safety Assessment, Institute of Metal Research, Chinese Academy of Sciences, Shenyang 110016, China

*Corresponding author: Tel: (024)23893723, E-mail: wangjianqiu@imr.ac.cn

Abstract: The interface region of welded A508-Alloy 52M is characterized by scanning probe microscope (SPM) techniques, scanning electron microscopy (SEM) / energy dispersive spectroscopy (EDS), transmission electron microscopy (TEM) / Energy Dispersive Spectroscopy (EDS) and scanning vibrate electrode technique (SVET). The regions along the welded A508-Alloy 52M interface can be categorized into two types according to their different microstructures. In the type-I interface region, A508 and Alloy 52M are separated by the fusion boundary, while in the type-II interface region, A508 and Alloy 52M are separated by a martensite zone. A508, martensite zone and grain boundaries in Alloy 52M are ferromagnetic while the Alloy 52M matrix is paramagnetic. The Volta potentials measured by scanning Kelvin probe force microscopy (SKPFM) of A508, martensite zone and Alloy 52M follow the order: $V_{52M} > V_{A508} > V_{martensite}$. The corrosion behavior of A508-Alloy 52M interface region is galvanic corrosion, in which Alloy 52M is cathode whileA508 is anode. The martensite dissolves faster than Alloy 52M, but slower than A508 in the test solution.

Key words: weld; interface; SPM; TEM; SEM; SVET.

1. Introduction

In pressurized water reactors (PWRs), low alloy ferritic steel (LAS) is used to manufacture nuclear pressure vessels for its high toughness and low cost, while austenitic stainless steel is