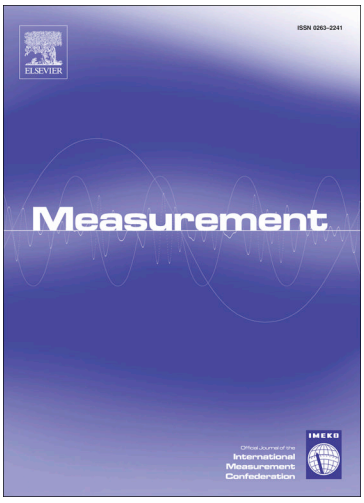

Inner circumferential current field testing system with TMR sensor arrays for inner-wall cracks inspection in aluminum tubes

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Inner circumferential current field testing system with TMR sensor arrays for inner-wall cracks inspection in aluminum tubes

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Abstract

Detection, localization and evaluation of internal defects are important subjects for the integrity management of aluminum tubes which are widely used in heat exchange, aerospace, transport and construction fields. Conventional nondestructive testing (NDT) methods are difficult to detect, locate and evaluate the defects in aluminum tubes in a one-pass scan. This paper presents an inner circumferential current field testing method for the inspection of inner-wall longitudinal cracks in aluminum tubes. The theory of the inner circumferential current field testing method is proposed, which is verified by simulations and experiments. The inner circumferential current field testing system is developed with tunnel magneto resistance (TMR) sensor arrays and the inner-wall longitudinal crack detection experiments are carried out in an aluminum tube. The results show that the inner-wall longitudinal crack can be detected, positioned and evaluated inside the aluminum tube in a one-pass scan using the circumferential current field testing system with TMR sensor arrays.

Key words: inner circumferential current field testing; TMR sensor; longitudinal crack; inspection; localization; evaluation

1. Introduction

For the advantages of lightweight, high-thermal conductivity and anti-corrosion, aluminum tubes have become a significant structural material in heat exchange,

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