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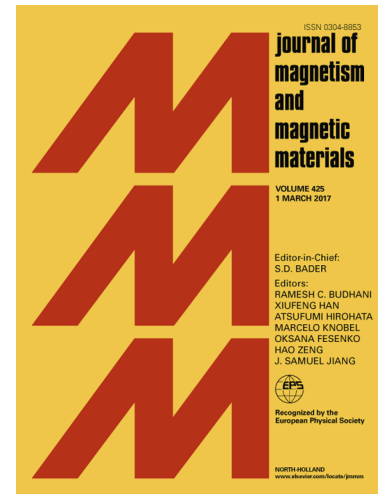
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Detection and evaluation of embedded mild steel *can* material into 18 Cr-oxide dispersion strengthened steel tubes by magnetic Barkhausen emission

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Abstract

The paper presents a new methodology for detection and evaluation of mild steel (MS) *can* material embedded into oxide dispersion strengthened (ODS) steel tubes by magnetic Barkhausen emission (MBE) technique. The high frequency MBE measurements (125 Hz sweep frequency and 70-200 kHz analyzing frequency) are found to be very sensitive for detection of presence of MS on the surface of the ODS steel tube. However, due to a shallow depth of information from the high frequency MBE measurements, it cannot be used for evaluation of the thickness of the embedded MS. The low frequency MBE measurements (0.5 Hz sweep frequency and 2-20 kHz analyzing frequency) indicate presence of two MBE RMS voltages peaks corresponding to the MS and the ODS steel. The ratio of the two peaks changes with the thickness of the MS and hence, can be used for measurement of the thickness of the MS layer.

Keywords: Oxide dispersion strengthened (ODS) steel; mild steel; magnetic Barkhausen emission (MBE); high frequency MBE; low frequency MBE

1. Introduction

Oxide dispersion strengthened (ODS) ferritic/martensitic steels are considered for future fuel cladding materials for sodium cooled fast reactors (SFRs). They are candidates for replacement of the present generation austenitic stainless steel (alloy D9 - modified austenitic stainless steel 15Cr-15Ni-Ti), due to their void swelling resistance up to about 180 dpa and creep resistance beyond 923 K [1-4]. The manufacturing procedure for the oxide (Y_2O_3) dispersed ferritic steel tubes follows powder metallurgical route. It involves mechanical

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