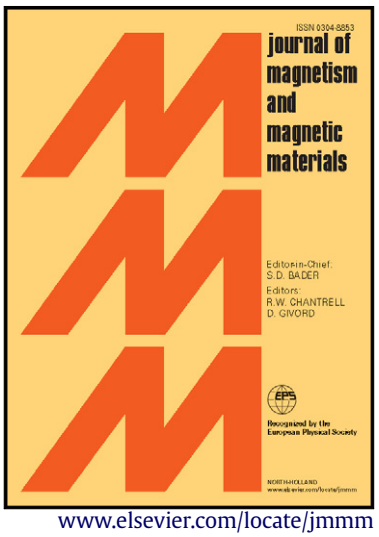

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Noise reduction by magnetostatic coupling in geomagnetic-field sensors

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Abstract: A new magnetoresistive (MR) thin film with a structure of "antiferromagnetic layer/pinned soft magnetic layer/non-magnetic MgO spacer layer/sensitive NiFe layer" was designed. The barber-pole MR elements with a Wheatstone bridge circuit were fabricated using photolithographic methods. The testing results show that, in comparison to the element with a typical structure of Ta/NiFe/Ta, the fabricated MR element shows significant reduction in the Barkhausen noise and the 1/f noise and good magnetic stability while maintaining high magnetic field sensitivity. This element with improved signals can be attributed to the magnetostatic coupling between the pinned soft magnetic layer and the sensitive NiFe layer, which can act as a small stabilizing field, leading to the coherent rotation of magnetic moment in the sensitive NiFe layer.

keywords: magnetic noise; magnetic stability; magnetostatic coupling; magnetoresistive element;

1. Introduction

In recent years, the development and application of spintronic materials/devices attracts much attention[1-5]. Of the spintronics devices, magnetoresistive sensors, such as giant

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