Development of GMI Based Sensing Device for Identification of Magnetic Phases in Steel

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Abstract

A giant magnetoimpedance (GMI) sensor based on CoFeSiBCr soft magnetic amorphous microwire of diameter 100 µm as a sensing element has been developed and the performances of the GMI sensor are carefully studied. The sensor measures the phase shift of the modulated signal in terms of voltage using balanced modulator/demodulator topology which has been calibrated in terms of localized magnetic field. The sensor shows a good linear response with the magnetic field. It has been tested at different conditions and repeatable of data has been observed. The sensitivity of the sensor has been observed to be 0.12 mV/Am^{-1}.

The sensor can be used to identify various magnetic phases in semi finished steel products. For an example, in duplex stainless steel where the material has austenite and ferrite components, the developed sensor can be utilized for the evaluation of volume fraction of each phase. Similarly, in 304 SS which undergoes stress induced martensite transformation can also be evaluated using the developed sensor.

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