

## Dynamic magnetic and magneto-mechanical properties of Fe-Co based alloy composites

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Polymer-bonded composites of Terfenol-D were reported to show good magnetostrictive properties both in static and dynamic conditions [1,2], but they are considered to be rather expensive for general application. Recently polymer-bonded composites of a Fe-Co based alloy were developed and their static magnetostrictive and mechanical properties were characterized [3]. The composites exhibited high magnetostriction of 105 ppm obtained at an applied magnetic field of 4.3 kOe and 200 ppm under a suitable compressive pre-stress. In this work, the dynamic magnetic and magnetomechanical properties

are characterized and an idea is to add WC to Fe-Co alloy powders in order to improve mechanical properties and resonance frequency of the composites for application at ultrasonic frequency. The Fe<sub>36</sub>Co<sub>62</sub>Ge<sub>2</sub> alloy powders with flake shape were mixed with a phenol-type binder, the amount of which was fixed at 10 wt.% and WC in the following weight proportion: 10, 20, 30, 40 wt.%. The shape of the composites was rectangular with dimensions of 3.5 mm \* 3.5 mm \* 10 mm (length). The measurement of magnetization is performed using air flux compensated pickup coils, which are employed both in the gap of a 1.5 T conventional electromagnet, and in the amorphous metal yoke suitable for high frequency characterization up to 40 kHz. The samples are fitted with 120 Ω bonded strain gauge and deformation measurements are performed using a half bridge configuration. The results for dynamic hysteresis loops are shown in Fig. 1. A peak induction of 0.6 T is achieved at 200 Hz, corresponding to a strain of 45 ppm, while at 10 kHz a peak induction of 0.2 T is measured, with a strain of 24 ppm. And then, the maximum value of

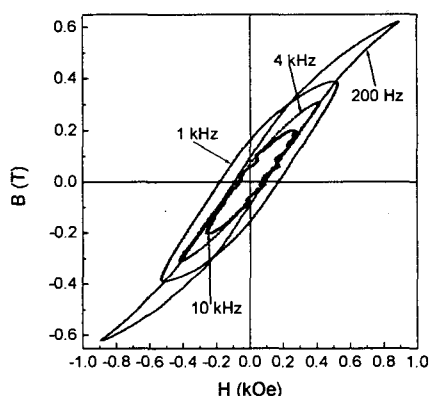


Fig.1. Dynamic behavior of the composite fabricated with WC content of 30 wt.%, binder content of 10 wt.% and an average particle size of 73 μm

Young's modulus is 67 GPa.

### References

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