Additive blending effects on the magnetic properties of nanocrystalline NdFeB magnets

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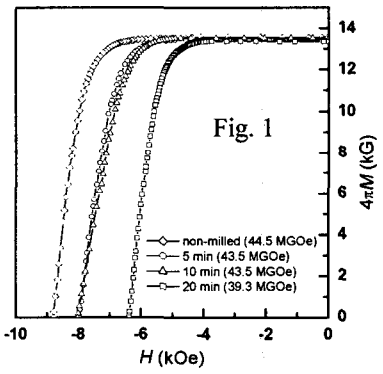
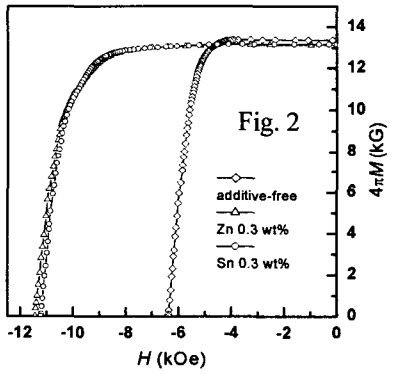
High performance nanocrystalline NdFeB magnets can be obtained by a hot working, hot-press and die-upset [1-2]. With deformation process, magnetically anisotropic magnets are obtained with higher remanence (B_r), but lower coercivity ($_iH_c$), compared to the hot-pressed precursors. In this work, we investigated the effects of Zn and Sn blending [3] on the coercivity ($_iH_c$) of the nanocrystalline NdFeB magnets obtained by current-applied pressure-assisted (CAPA) process [4]. The melt-spun NdFeB powder (Magnequench Inc., MQPA) and a pure Zn and Sn powder were mixed by a planetary ball mill for 5 - 20 min, CA-pressed and subsequently CA-deformed. For the additive-free samples, the $_iH_c$ of CA-pressed magnets were nearly the same regardless of the milling time. However, the $_iH_c$ of their CA-deformed magnets were decreased with milling time (Fig. 1). The low-level additive less than 1 wt. % was effective to prevent the deterioration of $_iH_c$ during deformation. The CA-deformed anisotropic NdFeB magnets with 0.3 wt.% Zn or Sn exhibited the $_iH_c$ about 80 % higher (11.4. and 11.2 kOe, respectively) than that (6.4 kOe) of the additive-free magnet (Fig. 2).





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