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Iron Nitride Magnetic Materials with High Saturation Magnetization and Low Coercivity (20140327, Dr. Jian-Ping Wang)

Ideal for Soft Magnetic Materials

A material with high saturation magnetization with low magnetocrystalline anisotropy—and therefore low coercivity—is expressed as α″-Fe16(NxZ1-x)2 (Z= C, B, O). This first of its kind combination of magnetic properties results from adding carbon dopants to the interstitial position of an iron lattice, where saturation magnetization remains almost same, but magnetocrystalline anisotropy decreases. This phenomenon obtains a combination of high saturation magnetization and low coercivity, ideal for magnetic writing heads of hard disc drives and other soft magnetic materials used in transformers and generators. This new material can be prepared in thin film, bulk or nanocomposite.

Low Magnetocrystalline Anisotropy

Soft magnetic materials with high magnetization and low coercivity are important building blocks of electromagnetic devices such as magnetic recording heads, transformers, inductors and sensors. Currently, ferrites, perm alloy and FeCo are used, but the first two have low saturation magnetization while the Fe-Co alloy has high saturation magnetization but also high magnetocrystalline anisotropy. Until now, soft magnetic materials with high saturation magnetization and low coercivity are not available in the market. α″-Fe16(NxZ1-x)2 is a novel material with high saturation magnetization and low magnetocrystalline anisotropy, and therefore low coercivity. This method differs from simply doping carbon while preparing Fe16N2 particles or bulk, because carbon doping increases coercivity.

BENEFITS AND FEATURES:

- Novel iron nitride magnetic material: α″-Fe16(NxZ1-x)2 (Z= C, B, O)
- High saturation magnetization
- Low magnetocrystalline anisotropy
- Low coercivity
- Prepared in thin film, bulk or nanocomposite

APPLICATIONS:

- Hard disks
- Soft write heads
- Transformers
- Inductors
- Sensors
- Magnetic recording heads
- Soft magnetic materials

Phase of Development - Proof of concept

Researchers

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Technology ID

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Publications

Minnealloy: a new magnetic material with high saturation flux density and low magnetic anisotropy
Journal of Physics D: Applied Physics, Volume 50, Number 37, Aug 2017

External Links

Nanospin Research Group