



VCU

VIRGINIA COMMONWEALTH UNIVERSITY

“High Anisotropy Nanoparticles for Magnetic Media” VCU #13-027

Applications

- Magnetic recording
- Dense memory storage
- Possible medical applications: targeted drug delivery or magnetic hyperthermia
- Components in nanoelectronic circuits

Advantages

- Increases areal density
- High magneto crystalline anisotropy and blocking temperatures
- Rivals rare earth permanent magnet characteristics

Inventors

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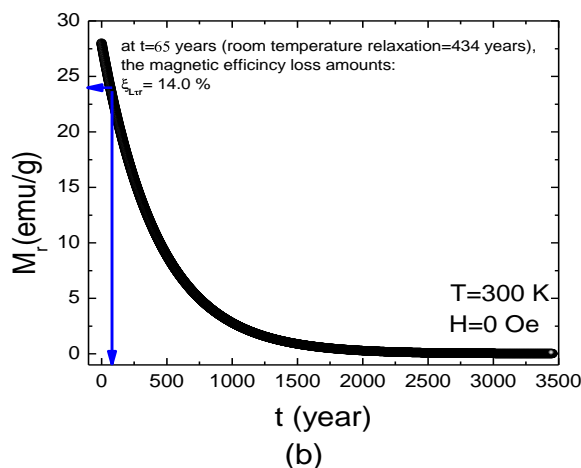
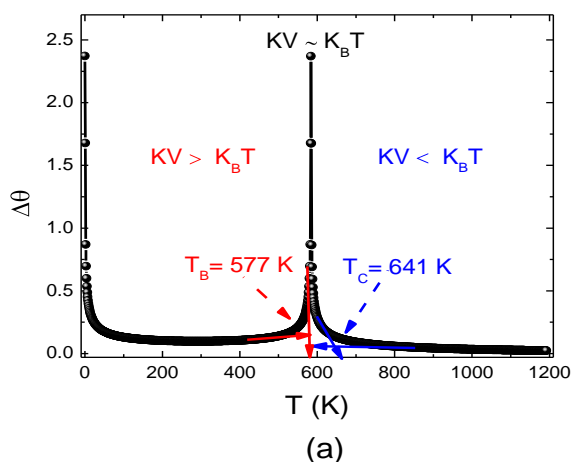
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Market Need

Permanent magnets made from rare earth metals are often used as the storage medium. For magnetic storage and other applications, these materials are often processed into nanoparticles. As the size of the particle is reduced, the magnetization of the material becomes unstable due to its susceptibility to changes in temperature. For some materials, the magnetization flips directions under the influence of temperature, causing a net magnetization of zero. Instability of the medium would lead to corruption of data storage. Finding an alternative material to the rare earth magnets is also beneficial due to uncertainties in that market.

Technology Summary

The technology is a new nanoparticle magnetic material (C-Co) for use in magnetic media. Using novel chemical synthesis methods, the magnetism of the material is more stable due to an increase in the directional dependence of the magnetic properties of the medium. This method creates a new phase of carbide with separated transition layers and a strong magnetic “pole to pole” alignment. This material and method allow for a magnetic medium that can remain stable at temperatures up to 500 Kelvin (~225°C). The figure on the left shows that the change rate of the direction of magnetic moment ($\Delta\theta$) remains stable for a large range of temperatures. As seen in the right hand figure, mediums made in this way should also retain their magnetism for an exceptional amount of time.



Technology Status

Magnetic nanoparticles have been produced and display similar magnetic properties to rare earth magnets.

Patent pending: U.S. and foreign rights are available

This technology is available for licensing to industry for further development and commercialization.