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Microscopy provides a closer look at promising next-generation magnetic storage medium

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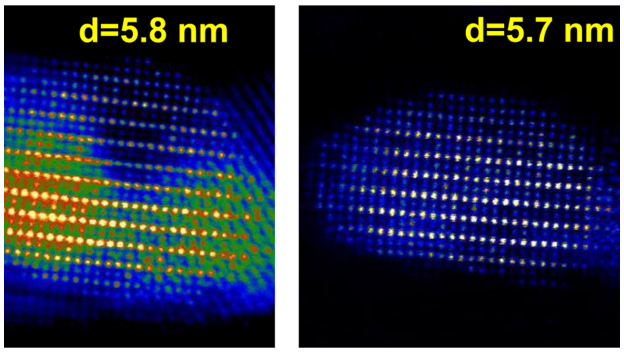
Researchers report a model that correlates structural characteristics with key magnetic properties in nanostructured FePt granular films.



Heat-assisted magnetic recording, or HAMR, is a technique for writing data to magnetic media that enables higher information storage densities than current-generation computer hard drives. The technique requires precise nanoscale heating in order to align a magnetic medium, and it also requires nanoscale magnetic units that can withstand continual use in consumer devices.

Thin films of granular iron-platinum (FePt) nanostructures are a promising magnetic medium for HAMR storage devices, primarily due to their ability to resist demagnetization. But early experiments with FePt films have revealed some drawbacks, such as large variations in their magnetic properties.

Now, work by Zhang et al. has examined these variations more closely by imaging ultrathin FePt films of different thicknesses with a scanning transmission electron microscope and X-ray diffraction. The researchers discovered that grain size played a major role in determining the FePt lattice structure in individual grains, finding that smaller grains had less lattice ordering and thus less favorable magnetic properties. The team also measured several analytical spectroscopic parameters related to impurities at grain boundaries and argued that they may lead to oxidation around grains that further degrades magnetic performance.

Based on their new data, the team proposed a model of the FePt grains that could account for some key magnetic parameters, including their Curie temperature and magnetic anisotropy. The calculated values showed good agreement with experimental data — an agreement that was not found without considering the physical scale of the nanostructures. The authors suggest that their work may "guide further improvement of FePt-based HAMR magnetic media" in the future.

Source: "Microstructure and magnetic properties of ultrathin FePt granular films," by Yuepeng Zhang, Alan Kalitsov, Jim Ciston, Oleg Mryasov, Burak Ozdol, Jiangtao Zhu, Shikha Jain, Bing Zhang, Boris Livshitz, Alexander Chernyshov, Antony Ajan, Paul Dorsey, Gerardo Bertero, Ramamurthy Acharya, Andrea Greene, and Sharon Myers, *AIP Advances* (2018). The article can be accessed at https://doi.org/10.1063/1.5022781.

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