

Application No. 119: Magnetic data storage model experiment

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How does magnetic data storage work?

Store memory magnetically? That makes many think about tapes and disks in the first computers. But they are long gone. Today, we use USB flash drives and memory chips. Alright. But there are still many magnetic storage media, some of them in every household:

- Audio and video tapes
- Hard drives in computers
- Data strips on ATM cards or on parking tickets
- Security labels on CDs or DVDs from the library



Flux detector as data storage
Source © Heepmann

And many data experts even claim that the life spans of data tapes and hard drives clearly beat those of self-burned CDs and DVDs.

That's why it's worth spending a few minutes on magnetic data storage. How does it actually work?

When I held the "flux detector" from supermagnete in my hands for the first time, I instantly had the idea that it could help make the magnetic recording and erasing easily understandable.

Material for the experiment:

- 1 Flux detector (M-05 (www.supermagnete.de/eng/M-05) or M-04 (www.supermagnete.de/eng/M-04))
- 1 Disc magnet (S-15-08-N (www.supermagnete.de/eng/S-15-08-N))
- 1 long nail as a recording/erasing pen

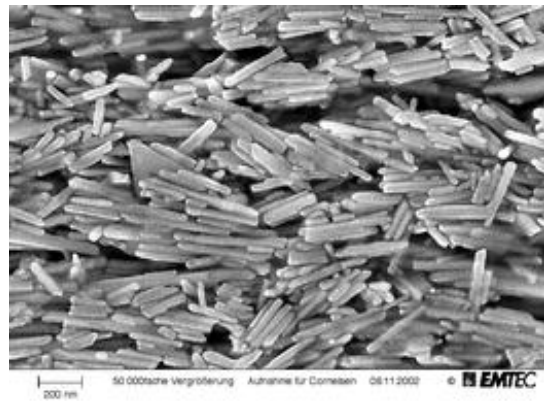
Execution of the model experiment: The magnet will be attached to the nail head. The flux detector M-05 (www.supermagnete.de/eng/M-05) is already laminated to protect against scratching. The type M-04 (www.supermagnete.de/eng/M-04) should be placed under a foil and on a white sheet of paper. With the nail point you write data (characters, words, etc.) on the detector. The data is best legible with a sideways exposure to light (see picture). The written data remains legible even after you remove the nail. Mechanical tremors don't influence the legibility at all. The data can be erased when you move the nail flat over the foil.

Why a model experiment?

Models help us understand, although they never reflect reality exactly.

That's also the case here:

- We use a permanent magnet for recording. In technology, this role is taken on by a tiny electromagnet with adjustable field strength.
- In the experiment the foil remains still and the recording magnet is moved. In technology it is the other way round.
- Data on the flux foil is legible for people. On an audio or videotape and on hard drives on the other hand, a microscopically small area is newly arranged during recording and put in complete disarray during erasing. Even under an electron microscope this data is not legible for us (see picture 2).
- We read with our eyes and our brain. "Read heads" in technology are electromagnets, in which the magnetic field that is moved past them creates a tension (through induction - like in a bike dynamo).
- The flux foil contains movable nickel particles cast in gel, which reflect the light in different ways depending on the arrangement. Magnetic storage media in technology contain glued iron or chromium nickel particles, on which magnetic areas (so-called Weiss domains) rearrange themselves.

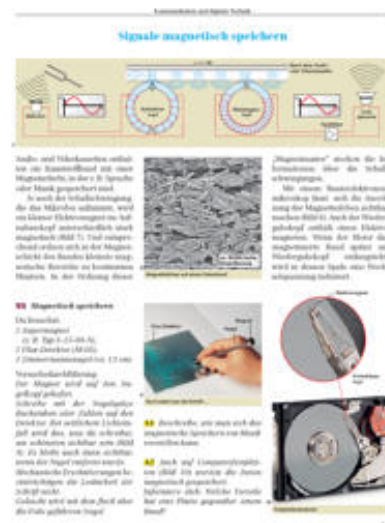


Magnetic particles on a data tape
 Source © EMTEC, Willstätt

Maybe you want to surprise your friends with this easy experiment and your natural science knowledge...

You can find more pictures on this topic on the page of a schoolbook for elementary and secondary schools in Baden-Wuerttemberg, which you can download here at no charge and with the kind approval of Cornelsen publisher.

Reference for the schoolbook: Heepmann, Bernd
 u. a.: **Materie - Natur - Technik, Band 6.** ISBN
 978-3-06-085040-2 © 2008 Cornelsen Verlag,
 Berlin.



pdf file, 190 kB

Articles used1 x S-15-08-N (www.supermagnete.de/eng/S-15-08-N)1 x M-05 (www.supermagnete.de/eng/M-05)

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