# Improved Method for the Production of Ultra High Density Magnetic Storage Media

*Introduction*

Magnetic storage media are indispensable computer components carrying operating system and application software as well as temporary data. Any PC hard-disk comprises a rotating disk with magnetic film. The film contains magnetic particles embedded in a nonmagnetic matrix material. A writing head induces persistent local magnetization in the film by aligning particle magnetic domains and thus stored data can be read out bit by bit by measuring the local field. Every bit is represented by a few or at least one magnetized particle.

R&D activities are currently focussing on further miniaturization of storage media, enhancement of storage density and reduction of manufacturing costs.

*State-of-the-Art*

Today, ultra high density (UHD) storage media can be manufactured at the very edge of physical limits. UHD media comprise ferromagnetic nanocolumns (nanowires oriented perpendicular to the disk surface) featuring very high aspect ratios (e.g. diameter ~ 5 nm, height ~ 250 nm). The nanocolumns are quite regularly spaced and electrically isolated from each other e. g. by a polymer matrix. One bit may be associated with a single column magnetic domain, leading to a theoretical storage density of terabit per square inch.

However, all known production processes are rather time-consuming and expensive. So far, patented methods have in common that at least two separate processing steps are needed: (i) for the formation of nanocolumns and (ii) for depositing and/or structuring the matrix, which is required to separate, stabilize and protect the nanocolumns.

*Invention*

Nanocomposite films comprising a matrix polymer and densely packed ferromagnetic nanocolumns **can be deposited on arbitrary substrates in a one-step process** under certain – non-exotic – conditions.

This can be achieved by exploiting a hitherto unknown physical self-organisation effect of nanoclusters during composite production. In principle, further post-processing of the films is not necessary for their use as UHD storage media. The invented method is compatible with standard microelectronic manufacturing.

*Development Status*

Nanocomposite films with properties mentioned above have been produced in laboratory experiments as a proof of concept. Since only a few material combinations have been examined by now, there are good opportunities for further R&D projects.

*IP right status*

A German patent has been granted in April 2006.

*Licensing*

Companies supplying the market of storage media and/or micro systems are sought as licensees or patent purchasers.
The inventors are academic researchers with expertise in the field of material sciences and extensive industrial cooperation experience. If required, evaluation samples might be produced with university equipment.

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