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Biography

Wolfgang Kleemann has completed his PhD at Goettingen University, Germany. After postdoc research at Université Paris-Sud, Orsay, and University of California, Santa Barbara, he became full Professor of University Duisburg-Essen, Germany, in 1982. His actual main research fields are magnetism, ferroelectricity, multiferroics and magnetoelectrics. His more than 450 publications have achieved over 12,000 citations at h-index 47. He has been serving in editorial boards of reputed journals and organization committees of various conference series.

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MULTIFERROIC AND MAGNETOELECTRIC NANOCOMPOSITES FOR DATA PROCESSING

Switching of magnetism with electric fields and magnetic control of electric polarization are challenging tasks for multiferroic and magneto-electric materials. For data processing applications various composite realizations appear most promising: We propose 2-2 nanocomposites based on magneto-electric (ME) chromia (111) films (Cr_2O_3), which allow electric switching of the magnetization of epitaxially grown ultrathin ferromagnetic Co/Pt/Co trilayers via inter-facial exchange bias. Random access memory (ME-RAM) and logic cell MEXOR have been approved. Regular composites of magnetostrictive cobalt ferrite ($CoFe_2O_4$) nanopillars are PLD-grown in a piezoelectric film of barium titanate ($BaTiO_3$). In a transverse magnetic field, they exert a staggered shear stress-induced surface pola¬ri-za¬tion pattern in the BaTiO3 environment. Possible data storage applications will be discussed. Ceramic 0-3 composites of antiferromagnetic-ferroelectric Bi $(Fe,Co)O_3$ nanoclusters embedded in K0.5Bi0.5TiO_3 reveal giant linear magneto-electric response via bilinear piezo-magneto-electric coupling, M=αE with α»10-5 s/m. They are candidates for future electrically addressable nanodot mass memory devices.

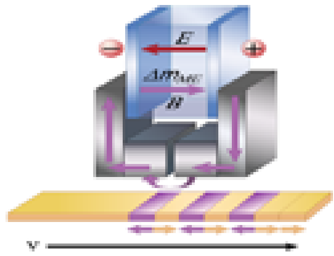

Fig.1: Magnetoelectric (ME) write head for magnetic hard disk. An electric field E gene-rates magnetic moment ΔmME in a ME material, thus giving rise to magnetic flux density B. A gap in the flux closing yoke emits a stray field, which writes a magnetic bit into the moving hard disk.

Recent Publications

1. Kleemann W (2009). Switching magnetism with electric fields. Physics 2: 105-6.
2. Borisov B et al. (2006). Magnetoelectric Switching of Exchange Bias. Phys. Rev. Lett. 94:117293.
3. Schmitz-Antoniak C et al. (2013). Electric polarization in nano-composites tuned by magnetic field. Nature Commun. 4:2051.
4. Henrichs LF et al. (2016). Multiferroic clusters. Advan. Funct. Mater. 26: 2111-2121.

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