Development of Nanostructure Controlled Super Strong Magnets

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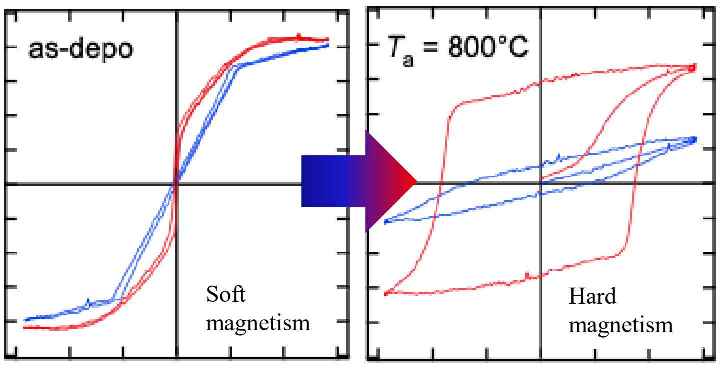
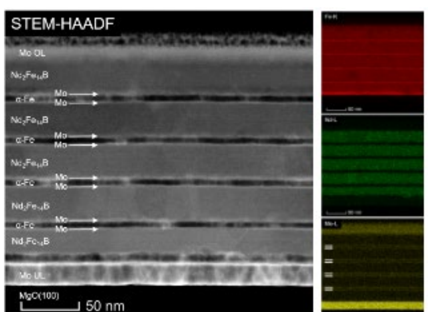
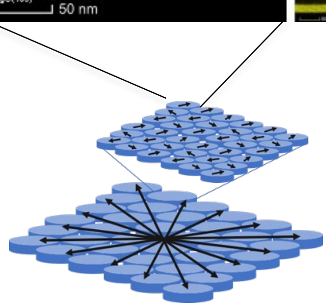
Formation of anisotropic nanocomposite magnet films by UHV sputtering process and laser annealing





Successful formation of magnets by crystallization from amorphous to rare-earth compounds while maintaining the layered structure.

Cross-sectional TEM images of multi-layered nano magnet films.



MEMS motor

Application of anisotropic nanocomposite film magnets by dot formation.

Content：
EV, HVEs, air conditioners, wind power generators, and MEMS actuators, etc. A variety of magnets are used, including the world's strongest neodymium and samarium-based Rare earth magnets are the most well-known. However, the magnet performance (coercive force) of rare earth magnets is only 10% to 30% of their theoretical value. This is due to the fact that the interfacial state between the magnetic hard and the grain boundary phases is far from the ideal. So, in my laboratory, we are aiming at improving the magnet performance and thin-film magnet applications by nanosizing the grains of the hard phase and controlling the interface with the intergranular phase.

Appealing point：
We are collaborating with other universities and research institutes to form model interfaces consisting of rare-earth magnet grains and grain boundary phases with high quality crystalline properties ranging from micron to nano size, which are comparable to those of sintered magnets, as well as nanocomposite model magnets consisting of magnetically different hard and soft phases, using thin-film processes to improve their properties.

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Research Interest ： Magnetic materials, Thin films

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