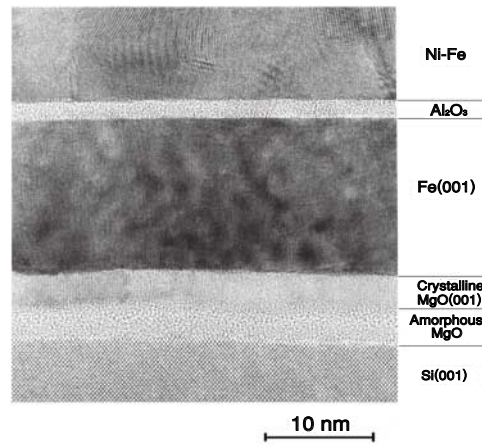


Development of High Performance Tunneling Magneto-resistive Devices

- Toward over G-bit M-RAMs -

Development of high performance tunneling magneto-resistive (TMR) devices is the key to realize Magneto-resistive RAMs over 1Gbit. The TMR devices with single crystalline magnetic electrodes enable significant enhancement of the TMR effect caused by the quantum size-effect.

We have developed TMR device with a single crystal Fe(001) electrode and by making it thin, as thin as several atomic layers, obtained significant enhancement of the TMR effect. The effect can be near 3 time lager than that for the thick Fe(001) electrode. We have also developed a process to make those high performance TMR devices on the LSI wafers. Picture shows TMR device grown on the SiO₂ surface. Very flat interfaces and a highly oriented bottom electrode have been realized.

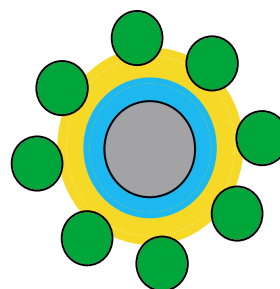


Cross sectional view of a tunneling magneto-resistive device grown on the SiO₂ surface. In the picture, Ni-Fe/Al₂O₃/Fe composes a tunnel junction

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A Composite Particle Named “Magneto-Liposome” as a Drug Capsule

A new type of composite particle is developed. It is consisted of a magnetic particle and several liposome particles and has a structure as shown in Fig. 1. Bi-molecular layered lipid-membrane liposome particles that can contain some pharmaceutical molecules in inner compartments are located around a magnetic particle, i.e., a silica-coated hematite through the binding properties of protein molecules. Because of its magnetic properties, we can control its location and hence will be able to supply pharmacy locally.



Schematic representation of magneto-liposome. Each region of the drawing shows a hematite particle (gray), a silica layer (light blue), a protein layer (yellow), or several liposome particles (green) from the center of the composite

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