研究スタッフ

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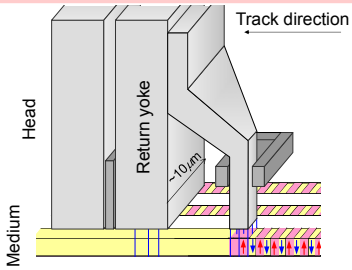
研究目的

本研究室では、スパッタ法を中心としたドライプロセスならびに化学合成を中心としたウェットプロセスを駆使することによって、超高密度磁気記録媒体、高性能・高感度を有するMRAM・SVヘッドおよび高周波デバイスを実現し得る、新たな材料設計・プロセス技術の確立を目指している。

主な研究テーマ

HDD beyond 1 Tb/inch□

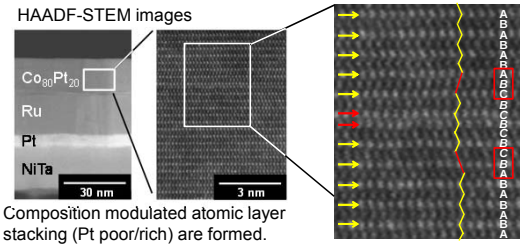


Media structure for perpendicular recording

In-line UHV sputtering machine

Composition modulated atomic layer stacking for high-K_u material

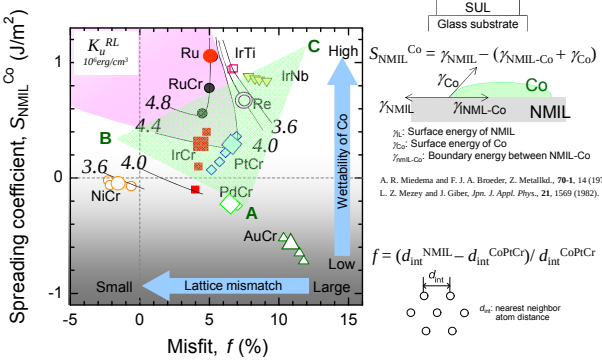
$Co_{80}Pt_{20}$ (T_{sub} = const. 300 °C, P_{Ar} = 2.0 Pa)



Composition modulated atomic layer stacking (Pt poor/rich) are formed.

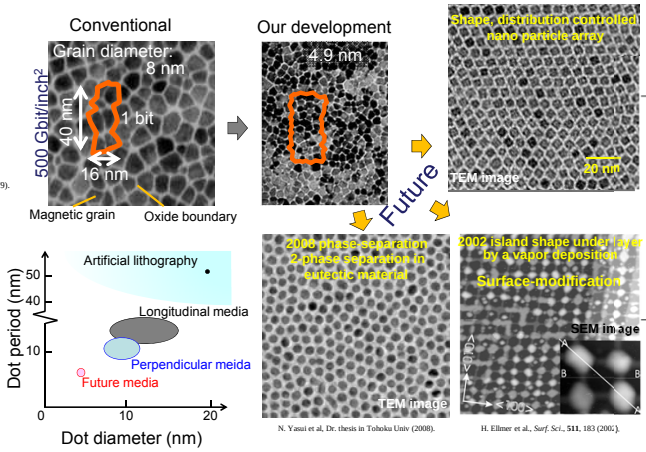
Fcc stacking as faults in macroscopic of hcp phase accompanies with irregularities for the periodicity of the compositional modulation

Alternative material to Ru

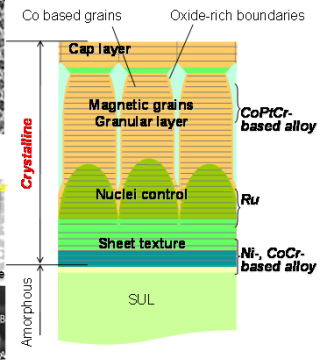


Key: Fcc with stacking faults, interface material design

Microstructure control

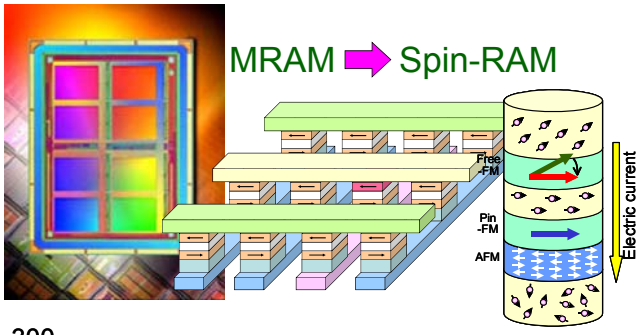


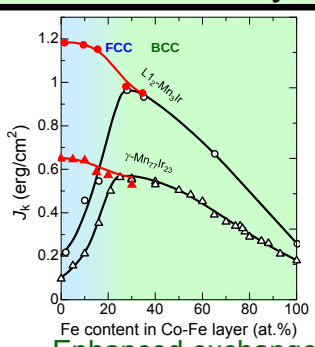
N. Yasui et al, Dr. thesis in Tohoku Univ (2008).
H. Ellmer et al., Surf. Sci., 511, 183 (2002).

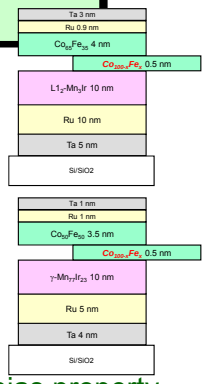


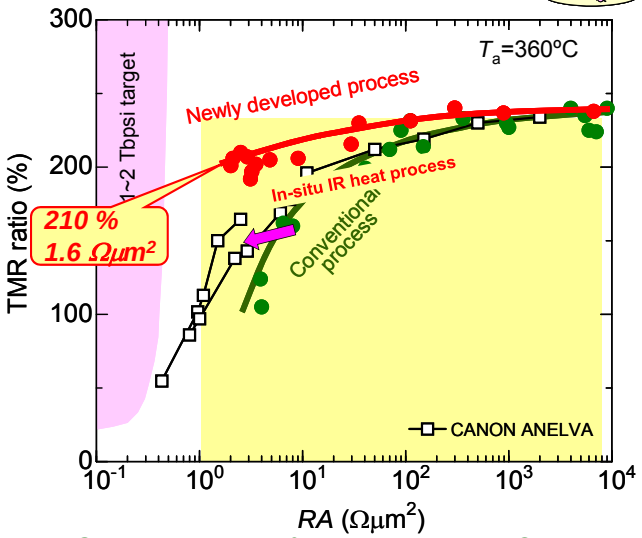
Ordered-arrangement structure by a self-assemble phenomenon

Spin nano technology for high performance magnetoresistive random access memory



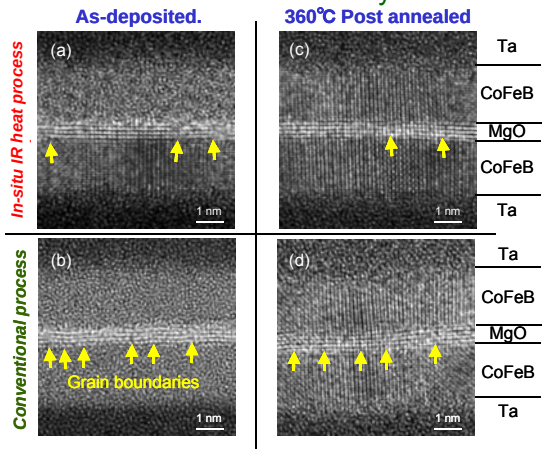






Giant TMR ratio & low *RA* with MgO barrier

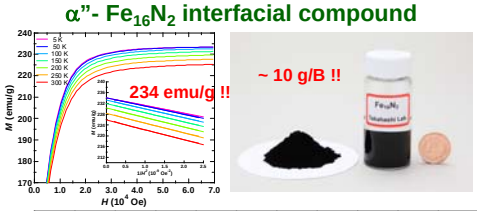
Enhanced exchange bias property with ultra-thin insertion layer

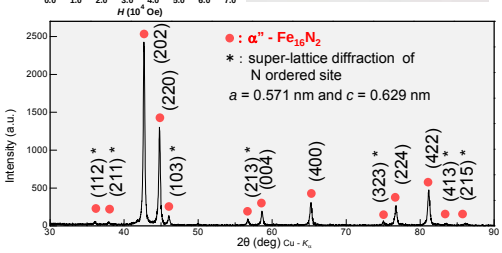


Promoting lateral grain size of the MgO barrier by the in-situ IR heat treatment

Fe-based magnetic nanoparticles for new magnetic devices

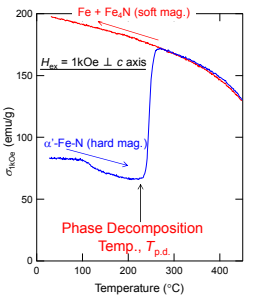
α"- $Fe_{16}N_2$ interfacial compound

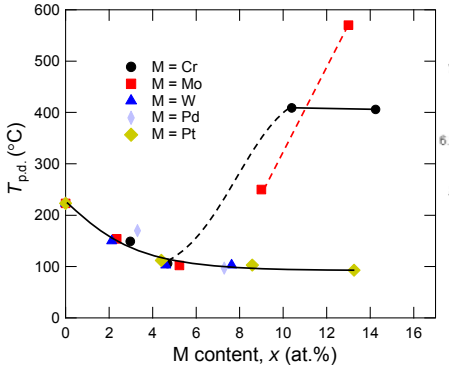


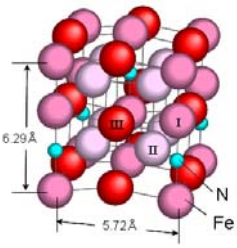


Single phase NPs formation with gram scale !!

α'-($Fe_{100-x}M_x$)-N (M=Cr, Mo, W, Pd, Pt) (N = 11 at.%) thin film

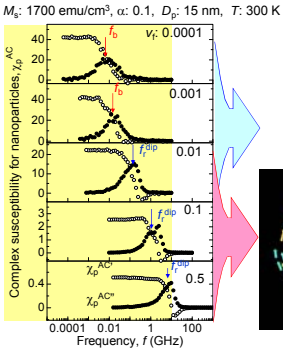


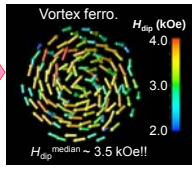


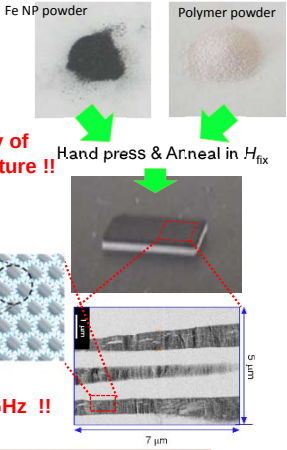


・Phase separation over 400 ℃ for Cr, Mo doped α'-(Fe, M)-N phase!!

Challenge to GHz-band magnetic response







High controllability of NPs assembled structure !!

Strong dipole interaction field enhances f_r > 10 GHz !!

産学連携を希望するテーマ例

- 薄膜材料の高品位、高付加価値、高機能化、および、新機能創出
- 磁性ナノ材料を用いた新機能の探索
- 磁性材料の評価技術に関する技術指導

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