



Assoc. Prof. **Ji SHI**

Graduate School of Science and Engineering  
Department of Metallurgy  
and Ceramics Science

Contact: 03-5734-3145; [shi@mtl.titech.ac.jp](mailto:shi@mtl.titech.ac.jp)

Lab HP: <http://www.nakamura-shi.mtl.titech.ac.jp/index.htm>

Research field: Metal physics, nano-materials, Magnetic thin films, Structural characterization

## Research topics conducted within the G-COE project

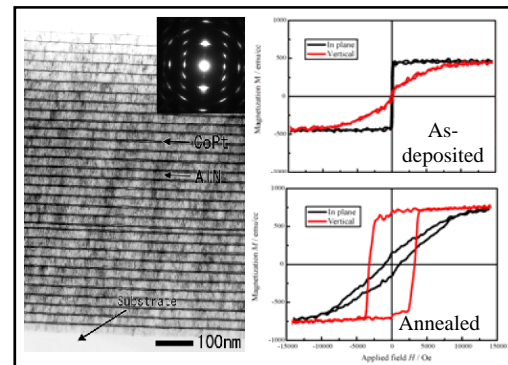
### 1. Novel properties of thin films by controlling the interface condition and stress state

This research work is aimed at conferring novel properties to thin solid films through controlling the interface, stress, growth orientation etc. of the films. The electronic structures, crystal structures and properties of the component phases are also taken into account when the films are prepared.

Our recent research is on the perpendicular anisotropy of CoPt/AIN layered structures. The relationship between the magnetic performance and interface conditions, stress inside the films are under investigation.

### 2. Development of new GMR materials

In this research, we are developing new preparation methods for preparing GMR materials. We have successfully prepared Co-Ti-O nanocomposited films with the oxygen concentration modulated along the growth direction. Such a film show 9% of magnetoresistance ratio at room temperature.



The TEM image on the left shows the structure of CoPt/AIN layered structure. And the magnetization curves on the right show the change from in-plane magnetic anisotropy to perpendicular magnetic anisotropy after annealing.

## Representative publications

1. Y. Hodumi, J. Shi, Y. Nakamura, Controlling the magnetic anisotropy in CoPt/AIN multilayer films, Applied Physics Letters, 90 212506 (2007).
2. Wanti Ekawati, J. Shi, Y. Nakamura, O. Nittono, Effect of Pt addition on the formation of Co-ITO granular magnetoresistance films by a two-step method, Journal of Vacuum Science and Technology, A24, 408-412 (2006).
3. T. Sannomiya, J. Shi, Y. Nakamura, and O. Nittono, Correlation between magnetization performance and magnetic microstructure of patterned permalloy films fabricated by microcontact printing, Journal of Applied Physics, 96 (2004) 5050.