

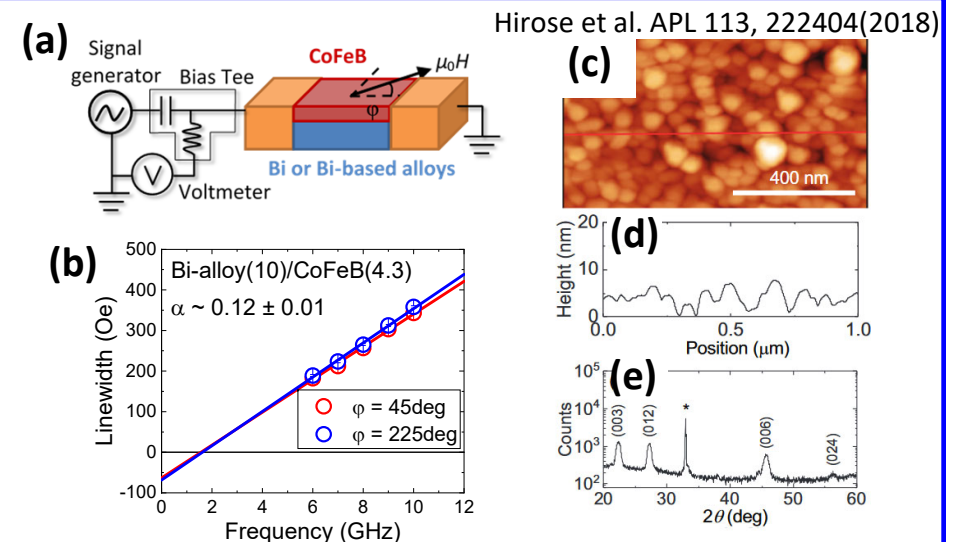
# 研究プロジェクト名: Spin dynamics in Bismuth-based heterostructures

**概要:** In sputtered Bismuth(Bi)-based alloys/CoFeB bilayers, the effective spin Hall angle can exceed the unity at room temperature, making the material an attractive spin current source. However, the large Gilbert damping ( $>0.1$ ) in these heterostructures is detrimental for many applications. Here, we intent to investigate the origin of the anomalous damping enhancement in Bi-based heterostructures. Spin dynamics in bilayers will be measured using the spin-torque ferromagnetic resonance(ST-FMR) technique. The crystal structure and the film roughness will be characterized using the X-ray diffraction(XRD) and the atomic force microscopy(AFM), respectively. Samples will be grown in The University of Tokyo, and measurements will be mostly done in IMR, Tohoku University.

**コアメンバー:** Lau・高梨Gr(東北大金研)、林Gr(東京大学)

## 期待される研究成果:

- Understand the spin transmission across interfaces containing Bi
- Reveal the origin of the Gilbert damping enhancement in Bi-based alloys/ferromagnet bilayers
- Establish potential correlation between the damping, the crystal structure, and the film roughness
- Achieve simultaneously large spin Hall angle and small Gilbert damping in bilayers containing Bi



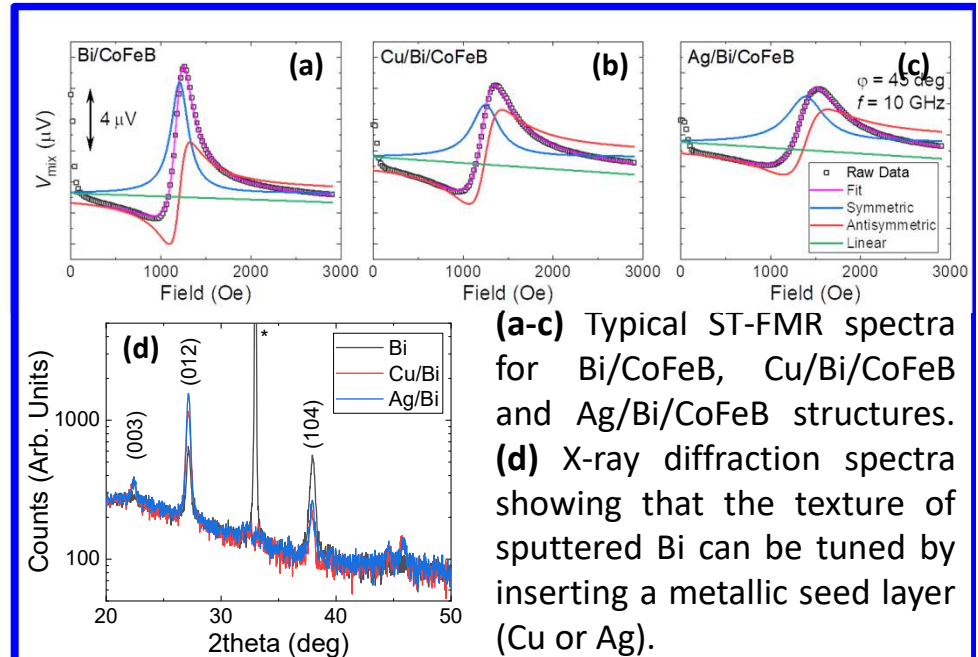
(a) Schematic illustration of the ST-FMR experiment. (b) Evaluation of Gilbert damping,  $\alpha$  from the slope of FMR linewidth versus frequency. (c-e) AFM image (c), line profile (d), and XRD spectrum (e) of 10nm-thick Bi film.

## 研究プロジェクト名: Spin dynamics in Bismuth-based heterostructures

**概要:** The structure and the morphology of sputtered Bi film strongly depends on the seed layer. We have investigated the seed layer dependence of the charge-to-spin conversion in Bi-based heterostructures via spin-torque ferromagnetic resonance (ST-FMR) technique. Samples were grown at the University of Tokyo (林Gr) and the FMR was measured at IMR.

### 研究成果(実施状況):

- Systematic investigation of spin dynamics and charge-to-spin conversion in Seed/Bi/CoFeB (Seed = None, Ag, Cu) heterostructures with varying Bi thickness
- These results are correlated with the helicity-dependent photocurrent measured in the same heterostructures



主要発表論文等: [1] H. Hirose, M. Kawaguchi, Y.-C. Lau, et al. (Submitted)