

DEVELOPMENT OF NOVEL ELECTRIC & MAGNETIC MATERIALS BASED ON ANALYSES OF CRYSTALLOGRAPHIC, ELECTRONIC AND MAGNETIC STRUCTURES.

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THE STUDY OUTLINE

We carried out the following two researches to develop novel electronic/magnetic materials and devices based on advanced analyses of crystallographic, electronic and magnetic structures. 1) We fabricated magnetic tunnel junctions (MTJs) with Fe/MgO/Co₂MnSn structures and investigated the structure and the physical properties. Transmission electron microscopy images indicate that an atomically flat MgO barrier is realized. We found sign change in tunnel magnetoresistance (TMR) effect with changing temperature at a fixed bias voltage around 0 mV. 2) By means of an electron diffraction technique, we investigated the crystal structure of a layered carbide Zr₂Al₃C₄ which contains triangular-lattices with mixed valence zirconium. Collections of electron diffraction patterns were carried out with and without magnetic fields. We observed decay of 100 type diffraction spots and emergence of diffuse scatterings in the diffraction patterns without magnetic field, in comparison to those in magnetic fields.

ACADEMIC PAPERS (total 3papers)

1. "Bias-voltage- dependence of magnetoresistance for epitaxial Fe/MgO/Co₂MnSn tunnel junctions",
M. A. Tanaka, T. Hori, S. Hori, K. Kondou, S. Kasai, T. Ono and K. Mibu,
J. Phys. : Conf. Ser. **266**, 012107 (2011).
2. "Synthesis and Structural Characterization of A New Aluminum Oxycarbonitride, Al₅(O,C,N)₄",
H. Inuzuka, M. Kaga, D. Urushihara, H. Nakano, T. Asaka and K. Fukuda,
J. Solid State Chem. **183**, 2570-2575 (2010).
3. "Crystal Structure of Layered Perovskite Compound, Li₂LaTa₂O₆N",
M. Kaga, H. Kurachi, T. Asaka, B. Yue, J. Ye and K. Fukuda,
Powder Diffraction **26**, 4-8 (2011).

CONFERENCE PRESENTATION (total 6 presentations)

1. "Bias-voltage- dependence of magnetoresistance for epitaxial Fe/MgO/Co₂MnSn tunnel junctions",
M. A. Tanaka, T. Hori, S. Hori, K. Kondou, S. Kasai, T. Ono, K. Mibu,
ISAMMA 2010, Sendai, Japan.
2. "Interface magnetism of Co₂MnSn Heusler alloy films prepared by atomically controlled alternate deposition",
K. Mibu, Y. Ishikawa, T. Hori, Y. Wada, and M. A. Tanaka,
MML2010, Barkeley, USA.
3. "Observation of the interaction between magnetic and crystallographic domains in the transition metal oxides",
T. Asaka, K. Fukuda, K. Kimoto and Y. Matsui,
4th International Workshop on Advanced Ceramics (IWAC04) Sendai, Japan.
4. 「原子層制御交互蒸着法で作製した Co₂FeSn ホイスラー合金薄膜の局所磁性とトンネル磁気抵抗効果」,
田中雅章, 石川佳樹, 和田悠希, 堀紫織, 壬生攻,
第 34 回日本磁気学会講演会, つくば国際会議場.
5. 「原子層制御交互蒸着法で作製した Co₂FeSn ホイスラー合金薄膜の局所磁性および電気伝導特性の評価」,
田中雅章, 石川佳樹, 和田悠希, 堀紫織, 村田敦, 壬生攻, 近藤浩太, 葛西伸哉, 小野輝男,
日本物理学会第 66 回年次大会, 新潟大学.
6. 「透過型電子顕微鏡法によるZ型六方晶フェライトの結晶・磁気構造解析」
浅香透, 福田功一郎, 石倉太志, 北川祐太郎, 木村剛,
日本セラミックス協会2011年年会, 静岡大学.