【Science and Engineering（Chemistry）】

Study of photo-spin science on the next-generation with multiple phase transition materials

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【Outline of survey】

A target of the research project is to create a novel phase transition in a chemically synthesized novel material which exhibits multiple phase transitions (ferromagnetism, ferroelectricity, spin transition, charge transfer transition, metal-insulator transition, spin reorientation, etc). Using these novel materials, we will also try to construct the next-generation photo-spin phenomena. In particular: (1) Development of novel multiple phase transition materials. (2) Creation of novel photo-spin phenomena such as photo-induced ferroelectric-ferromagnetism. (3) Establishment of "sub-terahertz magnetooptics" academic field by the first observation of the ferromagnetic resonance in 100-300 GHz range. (4) First observation of novel magnetization-induced nonlinear optical phenomena such as magnetization-induced nonlinear cascading process and magnetization-induced degenerated four-wave mixing.

【Expected results】

1. Development of novel multiple phase transition materials.
2. Creation of novel photo-spin phenomena such as photo-induced
3. ferroelectricity-ferromagnetism.
4. Establishment of the new magnetooptic field, sub-terahertz magnetooptics.
5. Proposal of new strategy for the next-generation opto-spinelectronic technology by first observation of the novel magnetization-induced nonlinear optic phenomena.

【References by the principal investigator】

- "Coexistence of Ferroelectricity and Ferromagnetism in a Rubidium Manganese Hexacyanoferrate", S. Ohkoshi, H. Tokoro, T. Matsuda, H. Takahashi, H. Irie, and K. Hashimoto, ***Angew. Chem. Int. Ed.***, 46, 3238 (2007).
- "Millimeter wave absorber based on gallium substituted ε-iron oxide nanomagnets", S. Ohkoshi, S. Kuroki, S. Sakurai, K. Matsumoto, K. Sato, and S. Sasaki, ***Angew. Chem. Int. Ed.***, 46, 8392 (2007).
- "Charge transfer-induced spin transition and photo-reversible magnetism in a cyano-bridged cobalt-tungstate bimetallic assembly", S. Ohkoshi, Y. Hamada, T. Matsuda, Y. Tsunobuchi, and H. Tokoro, ***Chem. Mater.***, 20, 3048 (2008).

【Term of project】 FY2008－2012	【Budget allocation】 81,200,000 yen (direct cost)

【ホームページアドレス】http://www.chem.s.u-tokyo.ac.jp/users/ssphys/index.html