液相コーティング法による希土類鉄酸化物（グリーンフェライト）薄膜の形成

Thin films of rare-earth iron oxides (green ferrites) prepared by liquid phase coating technique

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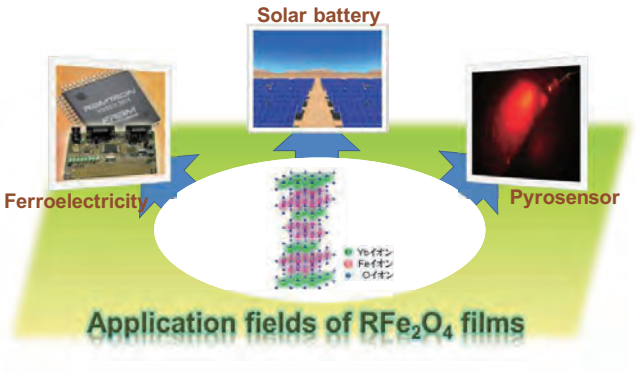
[Research Outline]

Rare earth iron oxide RFe_2O_4 (green ferrite) discovered in Japan in the 1970's attracts much attentions for future electric devices, because it has unique properties such as ferroelectricity, ferromagnetism, and high infrared absorption, in accompany with the electronic charge order. Recently, we first succeeded in preparing well-crystallized RFe_2O_4 films by using a liquid phase coating. To obtain the RFe_2O_4 films, optimizations of the solution preparation, coating and heat-treatment conditions were required.

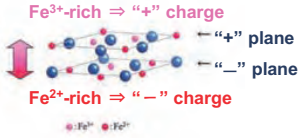


[Results]

Forming the RFe_2O_4 films ・・・

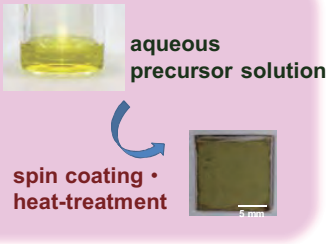
Technical issues

- Control the complex structure and composite
- Control the oxygen stoichiometry and iron charge order



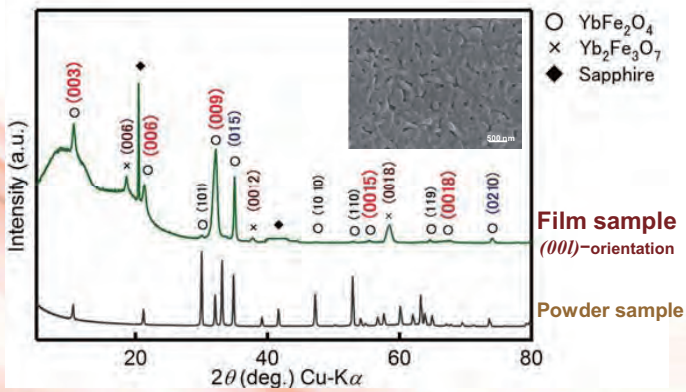
Solutions

- Coated with a homogeneous solution containing precursor ions
- Precise control of heat-treatment temperature and oxygen pressure during the crystallization process



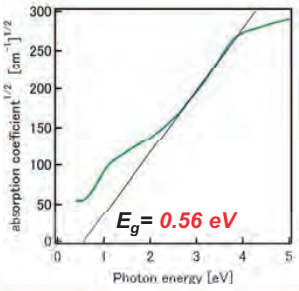
Characterization of the RFe_2O_4 films ・・・

Structure：XRD patterns and a SEM image

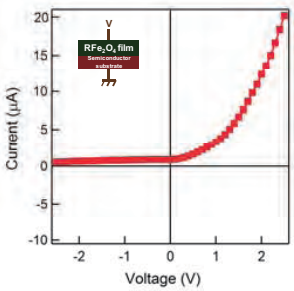


Properties：

Optical absorption



Electric conduction



- Absorption edge in the near infrared region
- Characteristics of the semiconductive nature

- RFe_2O_4 films were successfully grown on substrates
- Clear (*00l*)-orientation occurred on the sapphire substrate

[Research benefits]

- Simple equipment for making thin film ⇒ low cost（initial investment・maintenance）
- Use of pure water solvent system ⇒ eco-friendly/easy-recyclable
- p-n junction on semiconductor ⇒ demonstrate the potential of device applications

【Japan Patent Application】
- 特願2011-002596 Thin films of dielectric compounds and their synthesis
- 特願2008-308780 Synthesis of dielectric compounds

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