

38-20 Synthesis and Photoluminescent Properties of Titanate Layered Oxides Intercalated with Lanthanide Cations by Electrostatic Self-Assembly Methods

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Various lanthanide cations were intercalated into the interlayer of the exfoliated $H_xTi_{(2-x/4)}□_{x/4}O_4 \cdot H_2O$ (HTO) by electrostatic self-assembly deposition (ESD) and layer-by-layer self-assembly (LBL) methods. X-ray diffraction and thermal analysis data indicated that interlayer lanthanide cations existed as an aqua ion and were coordinated with 7-10 water molecules at ambient conditions. The interlayer distances were found to be in the range of 6-7 Å for HTO layered oxide intercalated with a lanthanide cation. Intercalation of lanthanide cations into the interlayer by LBL method was monitored by UV-vis spectrum and X-ray diffraction. Photoluminescence properties were also discussed in detail. Eu^{3+} intercalated layered oxide exhibited intense red emission at room temperature. The presence of interlayer water molecules was found to be inevitable for the emission with high intensity. The emission intensity was significantly high for the films conditioned at 100% RH than those at 5% RH. The ice-like behavior of the confined water molecules in the interlayer around lanthanide cations was believed to be contributing highly to the emission mechanism.

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