

38-17 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 the 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 under ambient conditions. The interlayer distances were found to be in the range 6-7 Å for HTO layered oxide intercalated with a lanthanide cation. Intercalation of lanthanide cations into the interlayer by the 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 higher for the films conditioned at 100% RH than those at 5% RH. The icelike behavior of the confined water molecules in the interlayer around lanthanide cations was believed to be contributing highly to the emission mechanism. The mechanism was illustrated and explained by data obtained under several conditions.

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