Shock-compression on \( \text{Eu}_2\text{O}_3 \) doped pollucite phosphors

SHO HAMADA, HIROAKI KISHIMURA, ATSUSHI ARUGA, HITOSHI MATSUMOTO, Natl Defense Academy — Pollucite \( \text{CsAlSi}_2\text{O}_6 \) is a natural mineral belong to zeolite group formed with analcime, and general formula is following: \((\text{Cs},\text{Na})_{16}\text{Al}_{16}\text{Si}_{32}\text{O}_{96-n}(\text{H}_2\text{O})\). The crystal structure of pure \( \text{CsAlSi}_2\text{O}_6 \) is cubic(Ia-3d) and unit cell is 136645 nm. Pollucite is stable stone yielding on the surface of the Earth since ancient times and is used to as a raw material of Cs element. \( \text{Eu}_2\text{O}_3 \)-doped pollucite phosphors are efficient white phosphor for Application of deep-UV-light emitting diode (LED). Phosphors were prepared by solid-state reaction. 1 mol\% \( \text{Eu}_2\text{O}_3 \)-doped and 3 mol\% \( \text{Eu}_2\text{O}_3 \)-doped pollucites were prepared. Shock-recovery experiments were conducted involving the impact of a flyer plate accelerated by a single-stage powder-propellant gun. The recovered samples were characterized by X-ray diffraction (XRD) analysis and photoluminescence (PL) spectroscopy. The XRD and PL results of samples shocked at pressures of 22 GPa indicated that dissolution and amorphous-to-crystalline transformation occurred. In addition, emission peak wavelength of 3 mol\% \( \text{Eu}_2\text{O}_3 \)-doped sample shift 20 nm (520→500 nm). As a result, it is considered that Eu\(^{2+} \) moved in the crystalline by shock-compression.