Poster Presentation

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High-pressure X-ray Diffraction Study of $SrSi_2O_2N_2:Eu^{2+}$

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$SrSi_2O_2N_2$ oxynitride crystallizes in the P1 space group [1]. This compound is an excellent host for phosphors, due to its superior thermal and chemical stability and large energy bandgap. Eu-doped $SrSi_2O_2N_2$ can be used in green LEDs, and as a green component in phosphor mixtures; it is suitable, in particular, for white LEDs. For application in LEDs, the most important feature of $SrSi_2O_2N_2:Eu^{2+}$ is the intense broadband luminescence at about 530 nm. In this study, high-pressure X-ray powder diffraction (XRD) experiments are used in order to experimentally determine, for the first time, the equation of state (EOS) of $SrSi_2O_2N_2:Eu^{2+}$. The studied sample, with Eu content of 2% was prepared by solid state reaction. The in situ XRD experiment was performed at the I711 beamline of MAXII synchrotron (Lund, Sweden) for a sample mounted in a diamond anvil cell, using hydrostatic compression conditions. The applied X-ray wavelength was 0.9917 Å. In the pressure range studied (up to 9.6 GPa) the triclinic structure is found to be conserved. Lattice parameters a, b and c decrease smoothly but slightly anisotropically as a function of applied pressure, whereas the angles α, β and γ vary marginally. The material is the most compressible in the b direction and the least compressible in the a direction. Angles α and γ are almost constant whereas the value of β angle slightly increases with rising pressure. The variation of unit cell volume with pressure served for determination of the Birch-Murnaghan EOS: the resulting bulk modulus value is 103(5) GPa. The present bulk modulus value is by 22% smaller than those reported for other oxonitridosilicates such as $SrSiAl_2O_3N_2$ and $Ce_4[Si_4O_4N_6]O$ (131.9(1) GPa and 131(2) GPa, respectively) [2].

[1] *O. Oeckler, F. Stadler, T. Rosenthal, et al., Solid State Sci., 2007, 9, 205–212,* ***[2]*** *B. Winkler, M. Hytha, U. Hantsch, et al., Chem. Phys. Lett., 2001, 343, 622–626*

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