Vibrational studies of crystalline phase strontium magnesium phosphates doped with Eu2O3

Abstract

In order to verify the assignments of the vibration modes and to find correlations in the changes induced by Eu2O3 in strontium magnesium phosphate with the composition of 27.5SrO-27.5MgO-45P2O5 as phosphor host matrix was prepared and investigated using Raman and Infrared (IR) spectroscopy. The doping concentration of Eu2O3 ions were varies from 1-5 mol%. The results of this study shows that Raman spectroscopy was give better structure change comparable to IR spectroscopy. Raman spectra of the studied sample present the specific bands of the phosphate network when doping with Eu2O3 ions, but structural change in IR spectra is unnoticeable, due to a characteristic of symmetry materials. The position of most Raman and IR bands do not coincide indicating a higher symmetry. The characteristics features of 27.5SrO-27.5MgO-45P2O5 undoped spectrum are the PO2 asymmetric stretching vibration band at 1240 cm-1, ?as(PO2), the PO2 symmetric stretching vibration band at 1171 cm-1, ?s(PO2), the ?as(PO3) groups (chain-end groups) at 1136 cm-1, the ?s of PO3 groups near 1062 cm-1, the ?as of POP groups at 900 cm-1, the ?s of POP groups at 780 and 688 cm-1 and the deformation modes of P–O-(PO43-) groups at 562 and 477 cm-1. The crystallized phases obtained with high doping Eu2O3, exhibited the Raman bands related to the orthophosphate (Q0) structure along with the pyrophosphate (Q1), and traces of metaphosphate (Q2) units. Based on stoichiometric, only Q1 and Q2 units were expected to be present, but the Raman spectra indicated detectable concentration of Q0 units, which results from disproportion reactions that occur during the reorganization of the powder sample.