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Determination of the structure of ZnS:ErF_3 TFEL phosphors using XAFS STANISLAV STOUPIN, Illinois Institute of Technology, CARLO SEGRE, Illinois Institute of Technology, MARK DAVIDSON, University of Florida, PAUL HOLLOWAY, University of Florida — Many phosphor systems that provide useful levels of IR emission have a poor match between dopant atom and the host structure. An example of such a system is ZnS doped with rare-earth elements incorporated into the host as trivalent ions. For example, the size of Er is quite large compared to Zn and it does not easily substitute into the same crystallographic site. We have prepared a number of ErF_3 1 mol% doped ZnS thin film electroluminescent (TFEL) phosphors using RF magnetron sputtering followed by annealing at various temperatures. The intensity of the IR emission is found to be very sensitive to the post-deposition annealing. As the local chemical and structural environment of the dopant atom is very important to the performance of the phosphor we have used x-ray absorption fine structure spectroscopy (XAFS) to provide detailed information on the local environment surrounding the Er atom. The XAFS spectra are consistent with Er-F complex substitution into the Zn site accompanied by creation of S vacancies. The ZnS host lattice reveals significant disorder effects in the first Zn-S coordination shell. These structural features change with annealing temperature and are likely responsible for the observed changes in intensity of the various Er emission lines.

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