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Investigation of Electroluminescent Degradation in doped ZnS phosphors[1] FRANK BRIDGES, JACOB STANLEY, YU JIANG, LAUREL RUHLEN, JOHN WILLY, SUE CARTER, Physics Dept. UCSC Santa Cruz 95064
— We present optical and EXAFS data on a series of ZnS samples doped with Cu, Mn and Cl. These materials (30 micron particles) have a strong electroluminescence (EL) when subjected to a 100V square-wave voltage. At 100 kHz, the luminescence decays significantly in a 20 hr period. We show that this degradation can partially be reversed by annealing the sample and that this can be repeated several times. In addition the EL emission centers reoccur at the same points in the 30 micron particles after the anneal. The optimum annealing temperature is about 180C, but varies slightly for different wavelengths. Surprisingly an anneal at somewhat higher temperatures (240C) dramatically reduces the EL intensity. The EXAFS studies show that the local structure about Cu continues to look like CuS for "as made", EL degraded, rejuvenated samples (annealing at 180C), and thermally degraded samples (annealed at 240C). This means that most of the Cu is in the relatively inert CuS precipitates, and does not change significantly with EL degradation or annealing. Thus the EL active sites must be dilute. We discuss some possible models.

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