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Degradation of ZnS:Cu,Cl on Micron Scale Using Time-Lapse Microscopy[1] SCOTT MEDLING, FRANK BRIDGES, SUE CARTER, UC Santa Cruz — CuS forms conducting needle-shaped nanoprecipitates in ZnS along the (111) planes which amplify the local electric fields and enable electroluminescence (EL) for $\sim$50μm thick devices at AC voltages of order 100V, a factor of 100 less than for DC EL in bulk ZnS. However, EL only occurs from tiny points (diameter $<$2μm) near the CuS nanoprecipitates. Unfortunately, devices degrade relatively quickly through a process that is not understood. We study how the light output varies spatially within 25μm particles during a long degradation process. From photodiode measurements we find that the total device light output can be modeled as a sum of two decaying exponentials. However, time-lapse microscopy indicates that the emission from many individual points within a particle often decreases in large, sudden, discrete drops. Furthermore, emission at some points increases, sometimes gradually and sometimes suddenly, by significant amounts during degradation. This suggests that the local electric fields may vary with time or that it is possible that Cu or Cl atoms could be diffusing out from and back into the active regions near the tips of the CuS on macroscopic time scales.

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