

Structure and location of electroluminescent light emission within ZnS/Cu ACEL powder phosphor particles

Localized electroluminescent (EL) light emissions have been imaged in ZnS/ Cu ac EL (ACEL) powder phosphor particles embedded under high-refractive index glass. Undistorted well-resolved images recorded at a series of depths from base to apex of individual particles show that in sharp focus the EL emissions are always small (1-2 μm) bright dots, often arranged along short straight lines. Comparison with backlit images shows that EL emission sites are near the phosphor surface. Image series recorded over a range of excitation voltages show that this surface luminous structure is unaltered under increased field strength, but more sites become active. There is no evidence for luminous comets within the particles. The data, clearly showing alternation of EL emission from side to side of the particles on opposite-polarity ac half-cycles, continue to support a mechanistic model in which electrons and holes are separated during one polarity and then undergo radiative recombination when that polarity is reversed on the succeeding half cycle. The small, surface-positioned emissive spots indicate that this charge-carrier separation does not occur at long acicular internal structures but rather at short Cu₂S structures active only at the ZnS surface.