Electroluminescence from Surface Oxidized Silicon Nanoparticles Dispersed Within Poly(9-Vinyl Carbazole)

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Research Summary:
- Electroluminescence (EL) from quantum confined crystalline silicon nanoparticles (Si nps) randomly dispersed within Poly(9-Vinyl Carbazole) (PVK) was obtained. The Si nps were fabricated in a nonthermal plasma, passivated ex-situ with a thin UV photooxidized shell, and dispersed in PVK using solution processing.

Major Observations:
- PVK(Si/SiO₂) EL (FIG. 1) was composed of simultaneous emission from PVK and Si/SiO₂ nps. The device emission was nonscalar with increased current density shifting from PVK to Si/SiO₂ np dominant emission (FIG. 2).

Research
- The device JV response was bulk dominated, independent of the np loading (FIG. 3). However, the Si/SiO₂ nps affected the carrier transport properties of the PVK films by increasing current density and reducing device turn on voltage (FIG. 4).

Major Conclusions:
- Nonscalar EL field dependence and bulk dominated carrier transport properties strongly suggest the observed Si/SiO₂ np EL was produced by direct carrier injection.

Publications: