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# Synthesis and characterization of new conjugated electroluminescent polyquinoline derivative

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The synthesis of new conjugated electroluminescent polyquinoline derivative Poly (2,2-(p-phenyl)-6,6-bis(4-phenylquinoline) [PPPQ], which are soluble in organic solvents and its incorporation in light-emitting diodes as the emissive layer are reported. These electroluminescent devices, containing 1, 1-bis (di-4-tolylaminopphenyl) cyclohexane (TAPC) dispersed in polystyrene as the hole-transport layer, emit bright yellow light ($\lambda_{max}$=554 nm) with quantum efficiency of 0.26% photons/electron and a luminance of 280cd/m$^2$ at a current density of 100 mA/cm$^2$. Electroluminescence of moderate brightness was achieved with blue-green, green, yellow, orange, and deep red colors depending on the arylene linkage of the copolymer. The thermal, electrochemical, photophysical, and electroluminescent properties of new polyquinolines varied with the arylene linkage, including p-phenylene, 4, 4-biphenylene, 5, 5-bithienylene. These results also demonstrate that the new polyquinoline is a good electron transport electroluminescent material. Large enhancement in electroluminescence efficiency and brightness of light-emitting diodes fabricated from binary blends of conjugated polyquinolines was observed compared to devices made from the homopolymers. The polymers have thermal properties with glass transitions temperature of 161-339$^0$C. The electrical properties of the diodes and electric field modulated photoluminescence spectroscopy results confirmed that the enhancement of electroluminescence in the blends originated from spatial confinement of excitons which leads to increased exciton stability and electron hole recombination efficiency. Voltage tunable and composition –tunable multicolor electroluminescence was observed in the polymer blend devices. The observed composition dependent new emission bands and enhanced fluorescence lifetimes in the blends were suggested to originate from exciplex formation and molecular miscibility between the blend components. These results demonstrate new phenomena in the electroluminescence and photophysics of multicomponent conjugated polymers.

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