

25.1: *Invited Paper*: Achieving Efficient Solid State Lighting Using Organic Light Emitting Devices

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Abstract

A significant challenge facing human kind in the 21st Century is how to address the ever decreasing supply of depletable and renewable energy. One approach to this problem is to decrease our usage. For this reason, considerable attention has been focused on more efficient means for room lighting which currently consumes approximately 20% of the total energy used. Organic light emitting devices (OLEDs) provide a unique opportunity to provide this high efficiency solid state lighting at very low cost. In this talk, I will discuss several strategies for achieving very high efficiency white light emission at high brightnesses for the next generation of efficient solid state lighting sources based on small molecular weight, vapor

deposited OLED structures. Key to our approach is the use of electrophosphorescence as a means for converting all electrical into optical energy. We show that the highest luminance efficiencies can be obtained by a combination of fluorescence and phosphorescence in a unique OLED structure. Furthermore, the highest brightnesses are achieved (without a significant loss in power efficiency) by stacking several fluorescent/phosphorescent elements in a single OLED structure (called a SOLED), with each emitting element in the stack separated by a transparent charge generation layer. Prospects for OLEDs as the next practical generation of interior illumination sources will be reviewed.