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“Influence of dipole orientation in organic light-emitting diodes”

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Organic light-emitting diodes (OLEDs) are promising candidates for future applications in general illumination. One of the most important aspects in the optimization of OLEDs is the outcoupling of light. Loss mechanisms like waveguiding in the organic layers and the substrate as well as the excitation of surface plasmons reduce the fraction of light that is leaving the device. We use numerical simulations to identify and quantify different loss mechanisms. In addition, the influence of the dipole orientation on light outcoupling is discussed. By using horizontally oriented dipoles the outcoupling can be increased by a factor of about 1.5 compared to randomly oriented dipoles. We present a method that allows the determination of the dipole orientation in fluorescent doped amorphous films by a simple photoluminescence measurement and comparison to simulations. Two materials are investigated, showing completely random orientation on the one hand and 91.3% horizontally oriented dipoles on the other hand.

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