Single Crystals for Remote Phosphor
Solid State Light Sources

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Background

The future of general and special lighting will be dominated by inorganic (and organic) light emitting diodes (LEDs). Nevertheless, phosphor converted (pc) LEDs for general lighting still show some shortcomings: The dissipation of heat and re-absorption limits the efficiency and the color point stability over lifetime of pcLEDs. In order to solve these problems a change of architecture is necessary.

A remote conversion screen is regarded as a solution towards LED driven light sources with an ultimate lifetime. This concept paves the way for the entry of thick ceramic bodies or single crystalline phosphors into solid state lighting.

Concept of Remote Phosphor LEDs

- LED-Chip
- Remote Phosphor

Spectroscopic Properties

Some spectroscopic properties of KYW2O8 (KYW) are shown in (Fig 3 - 5). The Quantum efficacy increases from 39% in KYW:Eu3+ (10%) to 47% for the 20% Eu3+ doped crystal. Furthermore, KYW:Eu3+ shows in contrast to LiEuMo2O8 (LEM, Fig 8) no temperature influence of the decay time (Fig 6 & 7).

Fig. 1. LEM crystal fragments of violet LEM (left) and shiny LEM (right) at ambient light (top) and upon excitation at 365 nm (bottom).

Fig. 2. KYW:Eu polished crystal at ambient light (left) and upon excitation at 410 nm (right).

Fig. 3. Excitation spectra of 10 and 20 % Eu doped KYW

Fig. 4. Emission spectra of 10 and 20 % Eu doped KYW

Fig. 5. Reflection spectra of 10 and 20 % Eu doped KYW crystals

Fig. 6. Decay Time of 10 and 20 % Eu doped KYW

Fig. 7. Decay constants of both LEM phases as function of temperature

Fig. 8. Normalized emission spectra of both LEM phases


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