

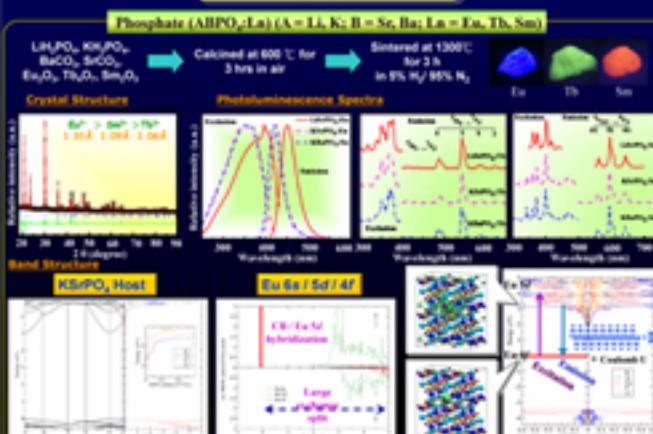
# Phosphors for White Light-Emitting Diodes in the Applications on Illumination and Back Light with Energy Saving

Chun Che Lin (林群哲) and Ru-Shi Liu\* (劉如臺)  
Department of Chemistry, National Taiwan University

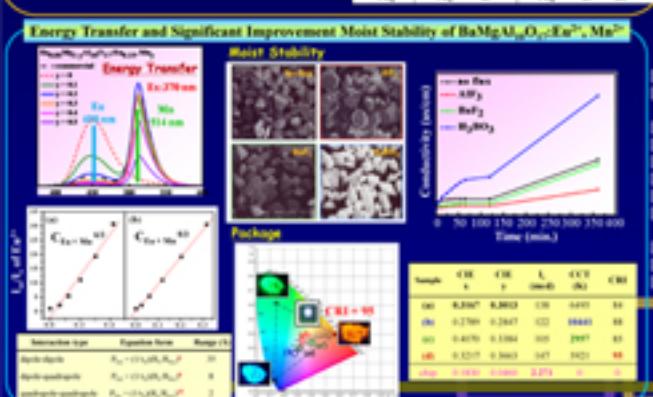
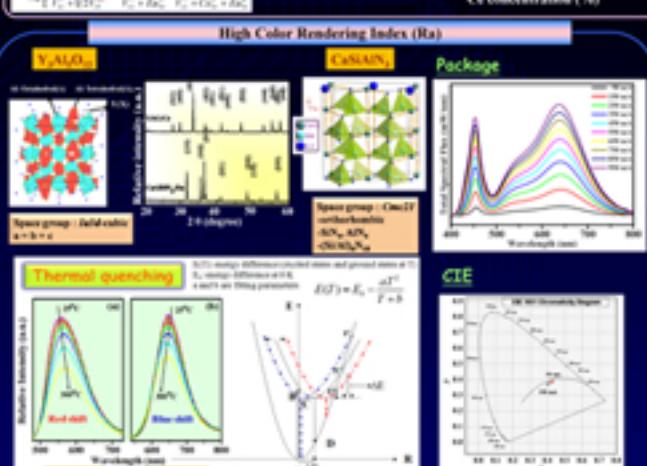
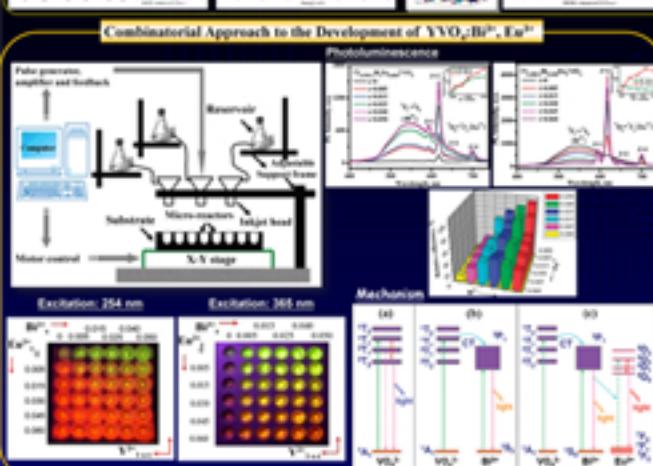
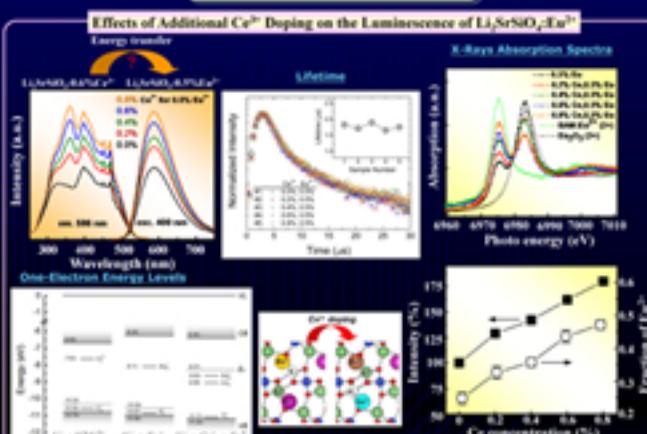
## Abstract

We synthesize the UV-LEDs excitable phosphors and the Blue-LEDs excitable phosphors for white light-emitting diodes (WLEDs) in the applications on illumination and back light with energy saving. In the UV-LEDs excitable range, we emphasize the physical and chemical properties of the orthophosphate host family,  $\text{ABPO}_4/\text{RE}$  ( $\text{A} = \text{Li}, \text{K}; \text{B} = \text{Sr}, \text{Ba}; \text{RE} = \text{Eu}^{2+}, \text{Tb}^{3+}$  and  $\text{Sm}^{3+}$ ). The desired single-mass-yellow phosphor is successfully screened out from the  $\text{YVO}_4\text{Bi}^{3+}, \text{Eu}^{2+}$  system by using a combinatorial chemistry approach.  $\text{BaMgAl}_10\text{O}_{19}$  (BAM) co-doped with  $\text{Eu}^{2+}$  and  $\text{Mn}^{2+}$  was synthesized in a solid-state reaction and their luminescence properties were investigated as functions of the concentrations of the sensitizer and activator. On the other hand, additional  $\text{Ce}^{3+}$  doping improved the luminescence of  $\text{Li}_2\text{SrSiO}_4\text{Eu}^{2+}$ , which was a yellow phosphor for ultraviolet or blue light emitting diodes. The proposed argument was validated with the first principle calculation about the defects formation energies. Furthermore, a mixture of  $\text{YAl}_5\text{O}_12\text{Ce}^{3+}$  (YAG:Ce) and  $\text{CaSAlN}_3\text{Eu}^{2+}$  was coated on a blue LED, the resultant WLED had a high luminous efficiency of  $\eta_e = 68 \text{ lm/W}$ , a high color rendering index of  $\text{Ra} = 93$ , and a color temperature of  $T_c = 3,007 \text{ K}$  (at 50 mA).

## UV-LEDs Excitable



## Blue-LEDs Excitable



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