

Novel luminophors for UV-LED based lighting device

Market Sectors: Chemistry, Lighting Industry

Type of Opportunity: Leiden University is seeking commercial partners for licensing.

Scientists at Leiden University have invented novel phosphor materials based on rare earth elements, which have excellent absorption properties in the near-UV and show strong blue and/or green emission with high quantum efficiency. This invention is particularly suitable for white LEDs based on near UV-LED chips.

White LEDs are highly required for general lighting purposes. Currently, there are two ways of producing white LEDs. One is to combine individual LEDs emitting in the blue, green and red spectrum region, and then mix three colours to produce white light. However, the low efficiency of the current green or yellow LEDs as well as the sophisticated control system limit this method.

The other way to produce a white LED is to use a phosphor material to convert monochromatic light from a blue- or UV-LED to broad-spectrum white light. The most commercially available white LEDs use a blue LED in combination with a yellow emitting phosphor, i.e. $\text{Y}_3\text{Al}_5\text{O}_{12}:\text{Ce}$ (YAG:Ce). Such dichromatic approach allows only lamps with high colour temperature, >5000K, to be obtained with relatively poor colour rendering index (CRI). These drawbacks can be overcome by using tricolour phosphors.

A series of novel phosphor materials, particularly suited for UV LEDs, have been invented by researchers at Leiden University. This invention provides phosphor material that has two emission centres, blue and green, thus emitting different colours. Since the relative concentrations of activators are adjustable at the atomic level, the desired colour between blue and green can be adjusted much more easily than by mixing two separate phosphors. These materials exhibit high levels of absorption property when subject to near UV-light, exceeding 95% at 380nm. They show intense emission with high quantum efficiency. These novel phosphors, when



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combined with a suitable red emitting phosphor, are ideal candidates for the near UV LED-based lighting devices.

Stage of development

These chemical materials have been produced and tested in a laboratory environment. Combination and optimisation with a red emitting phosphor has to be done.

Key Benefits

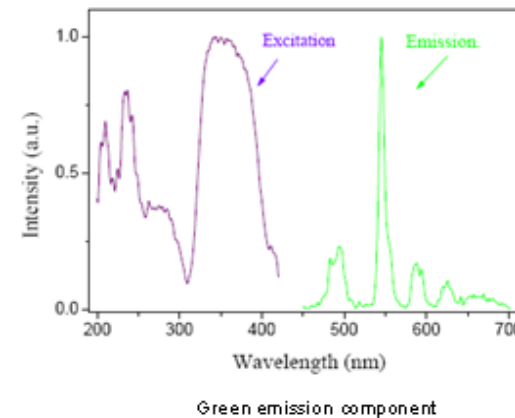
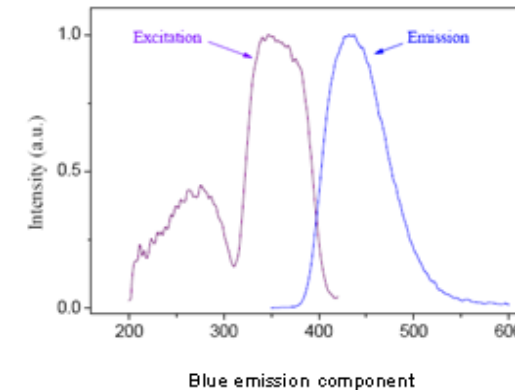
- Excellent absorption property in the near-UV region
- Capable of emitting two colours simultaneously with high quantum efficiency
- High chemical stability

Applications

- Ideal candidates for near-UV LED-based lighting devices

Patent status

For this invention a patent application has been filed.



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