Press Release

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Sumitomo Metal Mining Co., Ltd.

SMM Develops New Phosphor and Related Production Technology
Jointly with Tohoku University Research Team
~ Achievement Speeds Development of Phosphor for Use in White LEDs ~

Sumitomo Metal Mining Co., Ltd. (SMM), working in collaboration with a research team from Tohoku University's Institute of Multidisciplinary Research for Advanced Materials headed by Professor Masato Kakihana, has succeeded in developing a high-bright silicate prosphor[1] that glows bluish-green and yellow by irradiation of light across a range from near-ultraviolet to blue. Simultaneously, development has also been achieved of a new production method for the new material. The new silicate phosphor is expected to be applied in high-efficiency white LEDs[2].

White LEDs are used as sources of the backlight featured in LCD panels in LCD TVs and mobile phones. As demand today steadily shifts away from incandescent lamps, the market for white LEDs is projected to expand dramatically. But before white LEDs can come to replace fluorescent lighting, new phosphors are demanded that offer high luminescence efficiency and are capable of expressing natural hues, all at reduced cost.

SMM and Professor Kakihana's research team succeeded in developing the world's first barium-zirconium-silicon oxide phosphor incorporating europium ($(Ba,Eu)ZrSi_3O_9$), which emits a bluish-green color (480nano meter（nm）) when near-ultraviolet light is irradiated in a range from 290nm to 420nm. With irradiation of 405nm light, internal quantum efficiency [3] reaches 67%. Going forward, as further advances in efficiency are achieved, applications can be anticipated in high-efficiency white LEDs in combination with near-ultraviolet LEDs.

Another successful development is a high-bright phosphor ($(Sr,Ba,Eu)_2SiO_4$) that converts blue to yellow. It offers approximately 1.5 times greater luminescence brightness (excitation wavelength: 445nm; luminescence wavelength: 563nm) than conventional yellow phosphor (YAG:Ce). This new phosphor has

enabled development of brighter white LEDs.

An epoch-making aspect of this R&D initiative is that it utilizes a process employing a water-soluble silicon (WSS[4]) earlier developed independently by Professor Kakihana's research group in its production. Whereas earlier phosphor was produced by mechanically mixing solid powder material and firing it, the new method employs liquid material, which enables uniform mixing at the atomic level. In addition, the process featuring WSS enables parallel synthesis[5], which permits synthesis of materials of various compositions in one step; this in turn has enabled optimization of phosphor composition and more efficient exploration of new prosphors. It was using parallel synthesis that ((Ba,Eu)$ZrSi_3O_9$) was developed. Expectations are that proactive use of this new method will accelerate the development of new high-bright phosphors going forward.

In a quest to further improve the moisture resistance and luminescence properties of these phosphors, SMM is currently undertaking development of technologies for coating phosphor surfaces with a fine film. Already testing is under way toward establishing volume production technologies based on these research results, and we expect to commercially launch low-cost, high-bright white LED phosphors in the near future.

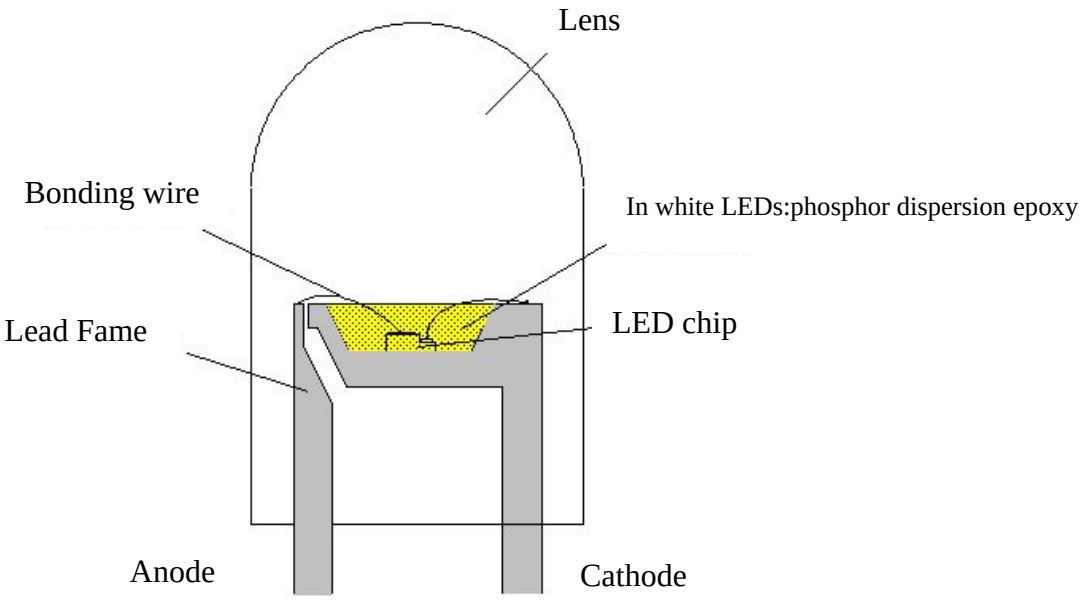
The content of this research is regarded as an important base material within the government-funded Fusion Materials Project. On January 22, an open symposium will be held at the University of Tokyo at which the results of research concerning WSS gelling properties will be presented.

SMM has been undertaking comprehensive joint research and development in collaboration with the Institute of Multidisciplinary Research for Advanced Materials of Tohoku University since 2003. In June 2010, a cooperative agreement was concluded between the company and the university in order to boost such joint R&D efforts and to strengthen their collaborative relationship. Development of the new phosphor technology is a tangible outcome of this comprehensive R&D and joint cooperation agreement, and going forward SMM intends to promote joint research based on the agreement further.

Notes:

1. Phosphor: a functional material that, upon absorbing light energy, emits light of a longer wavelength than the absorbed light. Phosphors are used in fluorescent lamps, white LEDs, plama displays, etc. Silicate phosphors are phosphors containing silicon (Si) as a constituent element.

2. Structure of white LEDs: LED chips emit blue light (455nm) and yellow light converted by phosphor from this blue light. Because blue and yellow are complementary colors, when mixed they appear white.



3. Internal quantum efficiency: among the photons absorbed by phosphor, the ratio of photons extracted as light-emitters.
4. Water-soluble silicon (WSS): a stable compound, soluble in water, made by bonding propylene glycol, etc. to silicon atoms. Until the development of the new compound by the Kakihana research team, there existed no compound including silicon that was both stable and soluble in water.
5. Parallel synthesis: a synthesis method in which several dozen testing materials are synthesized simultaneously under identical conditions. Use of water-soluble material enables easy extraction and mixing of multiple materials.

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