Preparation of Paintable Hybrid Polymers Showing Thermally-Stable White-Light Emission Based on POSS

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Polymeric materials with white-light emission have great attention as a promising candidate for paper-type illumination. In principle, combinations of two or three-types of different colors are necessary for generating white light. Therefore, the key point in the material design is to maintain a color balance suitable for white emission. In particular, since the material performance consisting of several components is often spoiled by temperature changes due to activation of molecular motion followed by phase separation, it is important not only to produce mixing state but also to maintain the original state. Herein, to realize thermoresistant white-light emission, we prepared hybrid polymers with a polyhedral oligomeric silsesquioxane (POSS) and a π-conjugated polymer having high thermal stability. POSS has a cubic structure composed of Si−O bonds and is used as an “element block” to create organic–inorganic hybrid materials at the molecular level (Figure 1).[1)]

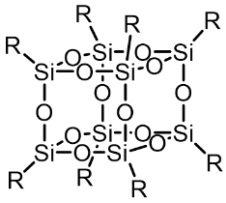

Figure 1. The structure of POSS.

Figure 2 shows the chemical structures of two luminophores, **TPE-POSS** and **MEH-PPV**. We were able to prepare homogeneous hybrid films with a spin-coating method from chloroform solutions containing **TPE-POSS** and **MEH-PPV** at arbitrary ratios. Figure 3 shows one of the resulting thin films showing white-light emission composed of **TPE-POSS** 95 wt% and **MEH-PPV** 5 wt%. From the variable temperature (VT) photoluminescence (PL) spectra and their CIE diagrams, it was clearly observed that the film maintained the color balance from 300 to 425 K. In summary, hybridization with the POSS and π-conjugated polymer is promised to be a simple and versatile method to create thermally stable light-emitting materials.

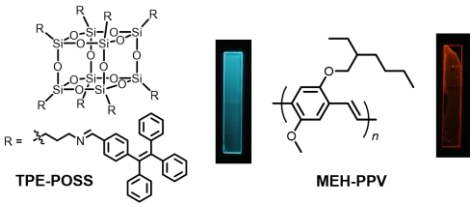

Figure 2. The structures and photos in films irradiated by UV lamp (365 nm) of mixed two components.

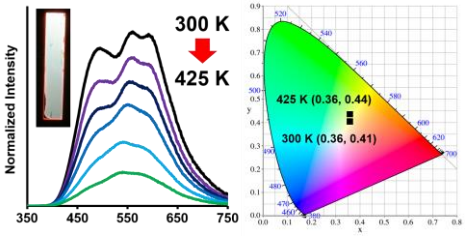

Figure 3. The resulted white-light emissive thin film composed of **TPE-POSS** 95 wt% and **MEH-PPV** 5 wt% and their VT PL spectra and CIE diagrams.

1) Chujo, Y.; Tanaka, K. *Bull. Chem. Soc. Jpn*. **2015**, *88*, 633.