Development of Highly Stable π-Conjugated Polymer Hybrid Films with Luminophore-Integrated POSS

([1]*Graduate School of Engineering, Kyoto University*) ○Yusuke Taguchi,[1] Masayuki Gon,[1] Kazuo Tanaka[1]

Keywords: POSS; Conjugated Polymer; Hybrid; Luminescence; Material

π-Conjugated polymers attract much attention because of their high conductivity, great optical properties, high functionality, flexibility and so on. However, their emission is generally quenched by aggregation (aggregation caused quenching; ACQ). To overcome this problem, We focused on polyhedral oligomeric silsesquioxane (POSS). POSS is a rigid cubic molecule composed of Si–O bonds possessing organic side-chains on each vertex. When π-conjugated polymers were hybridized with POSS derivatives, luminescence was observed at film condition because of the suppression of ACQ.[1)] In this research, we synthesized POSS derivative, which has luminophore on each vertex and make hybrid films by incorporating the POSS into luminescent π-conjugated polymer. These films exhibit luminescence with high stability.

The condensation reaction between 9,9-diphenyl-2-(2-phenylethynyl)fluorene-2-carboxaldehyde and amino-POSS yielded **DPPEFL-POSS** (Figure 1). Then **DPPEFL-POSS** was mixed into poly[2-methoxy-5-(2-ethylhexyloxy)1,4-phenylene vinylene] (**MEH-PPV**) and hybrid films were prepared by the spin-coat method. According to the optical measurements, as the POSS content increased, the photoluminescence intensity from the films increased (Figure 2). In addition, these optical properties exhibited high photo and thermal stabilities.

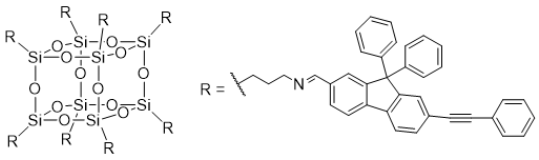

Figure 1. Chemical structure of **DPPEFL-POSS**.

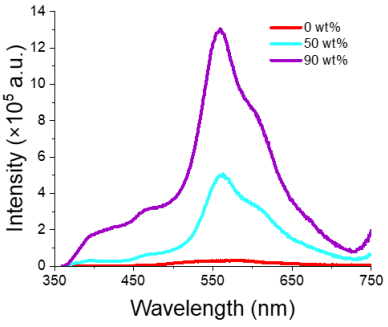

Figure 2. PL spectra of hybrid films with the excitation light at 345 nm. Numbers in Figure represent the POSS contents.

1) Gon, M.; Sato, K.; Kato, K.; Tanaka, K.; Chujo, Y. *Mater. Chem. Front.* **2019**, *3*, 314–320.