



第172回 OPERA研究交流セミナー

第163回 ISIT有機光エレクトロニクス研究特別室セミナー

第230回 未来化学創造センターセミナー



日時: 2017年5月11日(木) 16:00~

場所: 九州大学 共進化社会システムイノベーション施設 2F大会議室

High efficiency organic-inorganic hybrid perovskite light-emitting diodes

Tae-Woo Lee

Dept. of Materials Science & Engineering, Seoul National University, Korea

Organic-inorganic hybrid metal halide perovskites are emerging high color-purity emitters with low material cost. However, the low electroluminescence (EL) efficiency at room temperature is a challenge that should be overcome. Here, we present efficient perovskite light-emitting diodes (PeLEDs) using various strategies to overcome the EL efficiency limitations. First, we introduced a self-organized buffer hole injection layer to reduce the hole injection barrier and block the exciton quenching at the interface. Furthermore, we found that the formation of metallic lead atoms causes strong exciton quenching, and it was prevented by finely increasing the molar proportion of methylammonium bromide (MABr) in MAPbBr₃ solution. Also, we suggest that the efficiency in PeLEDs can be increased by decreasing MAPbBr₃ grain sizes and consequently improving uniformity and coverage of MAPbBr₃ layers. Using these strategies, a high-efficiency PeLEDs was realized (current efficiency = 42.9 cd/A). Furthermore, quasi-2D perovskites were studied because of the advantages of quasi-2D perovskites such as the enhancement of film quality, exciton confinement and reduced trap density, and quasi-2D PeLEDs with high efficiency and brightness were demonstrated.

[1] Y.-H. Kim, H. Cho, J. H. Heo, T.-S. Kim, N. Myoung, C.-L. Lee, S. H. Im, T.-W. Lee, Multicolored organic/inorganic hybrid perovskite light-emitting diodes. *Adv. Mater.* 2015, 27, 1248.

[2] H. Cho, S.-H. Jeong, M.-H. Park, Y.-H. Kim, C. Wolf, C.-L. Lee, J. H. Heo, A. Sadhanala, N. Myoung, S. Yoo, S. H. Im, R. H. Friend, and T.-W. Lee*, *Science* 2015, 350, 1222.

[3] J. Byun, H. Cho, C. Wolf, M. Jang, A. Sadhanala, R. H. Friend, H. Yang, T.-W. Lee, *Adv. Mater.* 2016, 28, 7515.

主催:九州大学 最先端有機光エレクトロニクス研究センター

:財団法人九州先端科学技術研究所(ISIT)

共催:九州大学 未来化学創造センター