PL, PLE, PLQY and TCSPC – the simple but powerful characterization suite for material development of nanocrystals

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Abstract

Colloidal nanocrystals have received much attention in the scientific community, owing to their impressive optoelectronic properties. This includes efficient photoluminescence, a prerequisite for successful translation into light-emitting applications. While device performance may be the final metric, characterizing the intrinsic material properties is necessary to comprehend the underlying physics as well as build intuition toward making better devices. Photoluminescence spectroscopy is a simple but effective technique to understand the correlation between material modifications and the resulting changes in photophysics.

The suite of photoluminescence (PL), photoluminescence excitation (PLE), photoluminescence quantum yield (PLQY), and time-correlated single photon counting (TCSPC) yields a treasure trove of information regarding a material's ability to emit light. In this presentation, I will describe several examples where photoluminescence studies have aided material development in the Sargent lab at the University of Toronto [1-3]. These examples will involve both colloidal quantum dots (CQDs) and perovskite nanocrystals (NCs), with a common theme of incorporation into a matrix.

References

[1] Li Na Quan *et al.* Adv. Mater., 29 (2017) 1605945.
[2] Cai-Feng Wang *et al.* Chem. of Mater., 29, (2017) 5104.
[3] Liang Gao *et al.* Nat. Photonics, 14, (2020) 227.