Spectral Variation in YAG:Ce^{3+} nanophosphor for white LED

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Yellow $Y_3Al_5O_{12}:Ce^{3+}$ nanophosphor was prepared through a high-energy planteary milling of micron-sized commercial powder as s reference. It showed the strong blue shift in emission peak from 540 nm to 530 nm, and drastic narrowing in blue-region excitation spectrum and the significant reduction in UV-region excitation spectrum. This is the reason why the nanoparticles can limit the phonon generation due to lattice defects at surface so that the photon-phonon coupling effect is reduced leading to the narrowing in excitation spectrum. The smaller photon-phonon coupling effect can also cause to the reduction in Stokes shift, and thus the blueshift in emission spectrum occures. This reduction of ponon population in the nanophosphor is confirmed by Raman spectrum. Especially this unsual excitation narrowing results in decreasing the spectral overlap between excitation and emission spectra, and it is expected to reduce the reabsorption rate so as to increase the luminescence efficiency. Finally the nanophosphor is applied to white LED for its feasibility test.

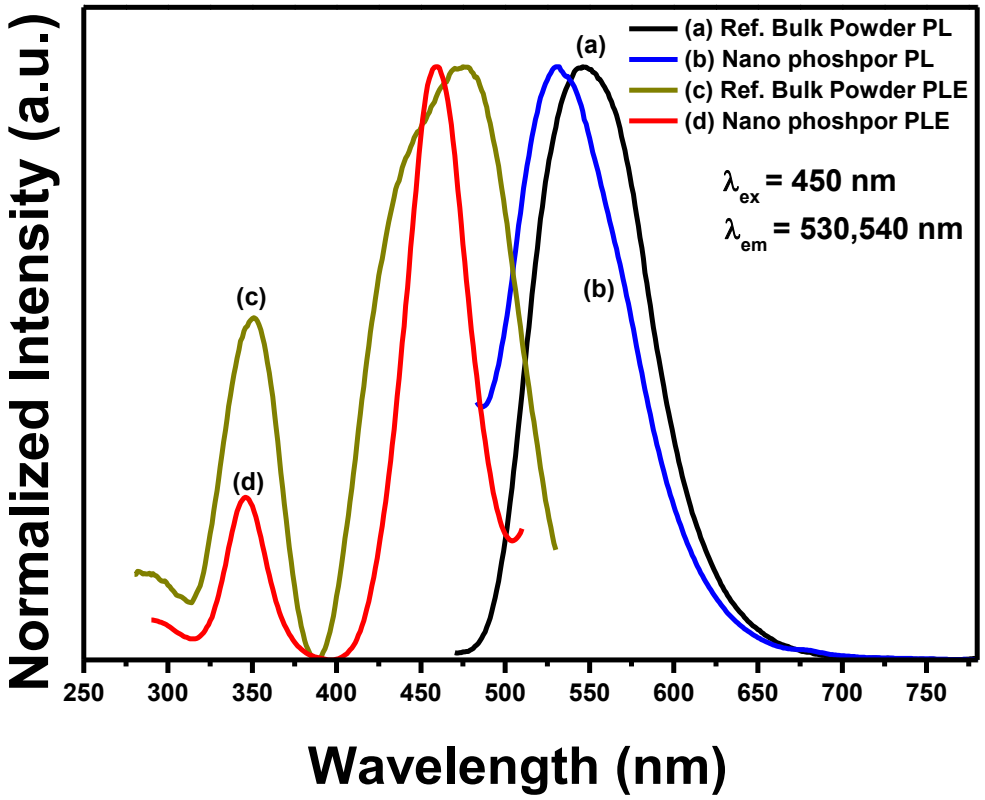

Fig. 1. Photoluminescence and photoluminescence excitation spectra of of YAG:Ce^{3+} nanophosphor and commercial powder.

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