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## Plasmon-coupled CuInS<sub>2</sub> and CuInS<sub>2</sub>/ZnS for hybrid white LEDs

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Plasmon-coupled CuInS<sub>2</sub> (CIS) and CuInS<sub>2</sub>/ZnS (CIS/ZnS) quantum dots (QDs) are of great interest for the hybrid white light-emitting-diodes. The plasmon-coupled excitons at various defect states of CIS with and without ZnS shell significantly enhance the spontaneous emission through the exciton recombinations from surface, shallow, and deep trapped states. The spontaneous emission enhancement of plasmon-coupled CIS QDs were ~2.4-folds compared to the average decay rates of CIS, and those of plasmon-coupled CIS/ZnS QDs were ~27.3-folds compared to the average decay rates of CIS/ZnS at shorter, intermediate, and longer spectral regions. The large PL enhancement is due to the local field enhancement and the reduction of nonradiative decay rate through the plasmon and exciton coupling. The temperature-dependent integrated PL of plasmon-coupled CIS at room temperature and 6 K displayed enhancements of two- and three-fold compared to the integrated CIS PLs, while the integrated PL of plasmon-coupled CIS/ZnS at room temperature and 6 K exhibited enhancements of five- and eight-fold compared to the integrated CIS/ZnS PLs. The Coulomb interaction and local field enhancement is responsible for the large PL enhancement and is characteristic of plasmon-exciton coupling. In addition to the large PL enhancement, the spectral coupling between the wide PL from CIS and CIS/ZnS and the blue diode excitation provides a hybrid white LEDs for photonic applications.

### Biography

Bagher Tabibi is a retired Professor of Physics and Scientist from Hampton University and NASA Langley Research Center, and is currently serving as a Research Professor and Principle Investigator (PI) for funded research programs. His research area includes atomic/molecular spectroscopy, stimulated Raman scattering, ultrafast non-linear laser spectroscopy, and quantum optics. He has published and presented over 250 journal publications and conference presentations as an author/co-author. In addition, he was a PI or Co-PI for numerous projects with a total budget over \$25M. One of his prestigious awards was the Group Achievement Award on the solar-pumped lasers for NASA's space mission in 1992.

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