Heterostructured semiconductor nanoplatelets with tunable emission and their application in light-emitting diodes

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Colloidal semiconductor nanoplatelets (NPLs) have been attracted much attention because of their unique properties such as narrow emission bandwidth, fast radiative transition and polarized emission. Especially, CdSe based core/shell NPLs are promising candidates for light emitting application because of high quantum yield and stability. However, the limited emission range from yellowish green to red is a big drawback as light-emitting material. In this study, we use Cd-to-Zn direct cation exchange reaction for tuning the composition and emission wavelength of heterostructured NPLs. Starting from CdSe/ZnS core/shell NPLs, new heterostructured NPLs, $Cd_{1-x}Zn_xSe$/ZnS NPLs, are synthesized by successful cation exchange. Incorporation of Zn effectively broaden the emission range covering green to blue. We observed that the unique optical properties of NPLs such as linearly polarized emission, as well as structure of NPLs are well maintained after cation exchange reaction. In addition, we applied the composition controlled NPLs in light-emitting diodes and investigated the optoelectronic properties.