Enhanced stability of InP quantum dots modified with PNIPAM under high temperature and humidity

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Quantum dot (QD) is being spotlighted as a display material thanks to its size-dependent optical properties such as narrow emission and broad absorption band. For device applications of QDs, stability issue is of great importance and is significant among InP based QDs. This issue includes degradation of QD properties by oxygen, water, heat, UV exposure and acidity. In this study, InP/ZnSeS/ZnS QDs were ligand exchanged with polymers to be used into PMMA nanocomposites. Each QD-polymer particle was prepared by surface modifying QDs with thiol-terminated PMMA and PNIPAM (QD-PMMA and QD-PNIPAM), respectively. Stability and performance measurements were carried out with QD-polymer particles containing nanocomposites; 85 °C/85% RH ~ 30 days and blue-LED on-chip electroluminescence. The results depicted similar performance levels between QD-PMMA and QD-PNIPAM but distinct difference of long-term stability under high temperature and humidity. QD-PNIPAM showed resistance during the test due to hydrophobic effects of surrounding PNIPAM which limited the interaction of water molecules with QDs surface.