

Indium Phosphide Quantum Dots for Multidrug-Resistant Bacterial Photodynamic Therapy

이일송, 이도창^{1,†}

한국과학기술원; ¹KAIST

(dclee@kaist.edu[†])

Multidrug-resistant (MDR) bacteria infection is a serious problem in many countries. Antimicrobial agents with high antibacterial efficiency and biocompatibility are desirable. Reactive oxygen species (ROS), which is toxic to bacterial cells, is one of reactive species responsible for the photoactivity of semiconductor nanoparticles. Herein, we have prepared highly efficient bactericidal colloidal nanocrystal quantum dots (QDs). The bandgap energy of cadmium-free QDs (indium phosphide quantum dots, InP QDs) was tuned their size. The cadmium-free QDs were treated to gram-positive (MDR Bacillus cereus and Staphylococcus aureus) and gram-negative (MDR Pseudomonas aeruginosa and Escherichia coli) bacteria and the bacterial viability was analyzed to confirm the QD-induced bacterial cell death. The cadmium-free QDs efficiently attacked and inhibited the bacterial cells, but had less effect on the mammalian cells (HeCaT, COS-7 and dermal). Animal experiments further showed that the cadmium-free QDs can effectively treated wounds infected with MDR Staphylococcus aureus. The cadmium-free QDs could be used for clinical photodynamic therapy to care the bacterial infections.