# EFFECT OF DOPING ON THE PERFORMANCE OF PBS QUANTUM DOT PHOTOCONDUCTIVE IR DETECTORS

**Sandamali H. M. I. R.*, Udayangani U. V. K., Farhana M. A. and Jaseetharan T.**
*Department of Physical Sciences, Faculty of Applied Sciences, South Eastern University of Sri Lanka, Sammanthurai, Sri Lanka*
**sadamalihmir@gmail.com*

Semiconductor quantum dots are attractive nanomaterials to be used in numerous research areas and device fabrication such as detectors, light-emitting diodes, transistors, and photovoltaic cells due to their unique optoelectronic properties. Tunable energy gap by quantum confinement effect and multiple exciton generation are the most important unique properties of the quantum dots. In this study, Cost - efficient PbS quantum dot – based photoconductive type infrared (IR) detectors have been fabricated and studied the effect of doping on the performance of PbS quantum dot photoconductive IR detectors. PbS quantum dots were deposited on the electrode by successive ionic layer adsorption and reaction (SILAR) technique. Best number of SILAR cycle corresponding the maximum responsivity of the detector has been optimized. In order to find the suitable dopant for the PbS quantum dots, same concentration (3 mM) of $Mn^{2+}$, $Zn^{2+,}$ $Cu^{2+}$ and $Ni^{2+}$ ions have been used separately. Suitable doping concentration of the best dopant has been optimized. 3 mM $Zn^{2+}$ – doped PbS quantum dot photoconductive IR detector corresponding to 35 SILAR cycles shows a highest responsivity of 11.6 µA $W^{-1}$ under the illumination of 0.25 W with a monochromatic radiation with the wavelength of 940 nm. Zn - doped PbS quantum dots are the suitable candidates for low-cost IR photon detection.

***Keywords**: IR detector, Multiple exciton generation Quantum dot, Quantum confinement effect, Successive ionic layer adsorption and reaction (SILAR).*

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