

Application of quantum dots in solar cells and biomedical applications

Mannix P Balanay¹, Bakhytzhan Baptayev², Aigerim Baimyrza¹ and Rachid Babaa¹

¹Nazarbayev University, Kazakhstan

²National Laboratory Astana - Nazarbayev University, Kazakhstan

There has been an increasing use of quantum dots for various applications in recent years. In this talk, author will be focusing on the use of quantum dots as counter electrodes in dye-sensitized solar cells (DSSCs) and as bioimaging and possible cancer treatment. In DSSCs, the use of Pt is still widely used as counter electrodes (CE) owing to its high catalytic efficiency and stability but the downside is its cost. In this regard, we synthesized a tri-doped natural carbon dots as an alternative CE in DSSCs. We assessed different metal ions with ethylenediamine and sulfur powder as additives. We also applied sulfur-limonene polysulfide as substrate for our quantum dots. All our results showed efficiency very close to the Pt electrodes which could be used as low-cost CE alternatives. Water-soluble fluorescent carbon-dots derived from natural sources having a particle size <2 nm were used as possible bioimaging agent and cancer treatment. Various characterization data and possible new approach in the stimulation of ARF-mediated signaling to inhibit nuclear YAP using nanomaterials will be discussed.

Recent Publications

1. Estrella L L, Balanay M P and Kim D H (2018) Theoretical insights into D-D-A sensitizers employing N-annulated perylene for dye-sensitized solar cells. *Journal of Physical Chemistry A* DOI:10.1021/acs.jpca.8b03331.

2. Xie Y, Sun Q, Nurkesh AA, Lu J, Kauanova S, Feng J, Tursynkhan D, Yang Q, Kassymbek A, Karibayev M, Duisenova K, Fan H, Wang X, Manarbek L, Maipas A, Chen Z and Balanay M P (2017) Dysregulation of YAP by ARF stimulated with tea-derived carbon nanodots. *Scientific Reports* 7:16577.
3. Balanay M P and Kim D H (2017) Strategic design of bacteriochlorins as possible dyes for photovoltaic applications. *Journal of Physical Chemistry A* 121:6660-6669.
4. Balanay M P, Choi K S, Lee S H and Kim D H (2017) Experimental and theoretical analysis of organic dyes having double D- -A configurations for dye-sensitized solar cells. *Spectrochimica Acta Part A* 173:361-368.

Biography

Mannix P Balanay has completed his PhD in Physical Chemistry from Kunshan National University, Republic of Korea and subsequently hired as a Research Professor in the same University. Before coming to Korea, he was an Instructor at Siquijor State College and Silliman University. Currently, he is an Assistant Professor in Chemistry at Nazarbayev University, Astana, Kazakhstan. His work applies both computational and experimental techniques to study various materials that are relevant to the current needs of the society, such as energy, environment and health.

mannix.balanay@nu.edu.kz