Abstract No: 176 ***Physical Sciences***

Zn AND Ni BASED METAL-ORGANIC FRAMEWORKS FOR PHOTOVOLTAIC APPLICATION

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Metal-organic frameworks (MOFs) are a class of materials which are identified as three-dimensionally linked coordination networks, and they are formed by metal ions or clusters linking with rigid organic linkers. Hence, MOFs possess remarkable properties and synthetic flexibilities which allow tuning their properties. Thus, MOFs have attracted great attention among researchers for their applications in the energy sector, such as light/energy harvesting and energy-storing. MOF-74 (Zn) [zinc(II) 2,5-dihydroxyterephthalic acid (DHTP)] and MOF-74 (Ni) [Ni(II) DHTP] are two coloured MOFs which belong to the MOF-74 family. Both have the same organic ligand and two different metal centers. In this study, a core-shell structure of MOF-74 (Zn, Ni) was synthesized by incorporating TiO_2 nanoparticles, to enhance the light-harvesting and conductivity of TiO_2 nanoparticles. These two composites, MOF-74(Zn)/TiO_2 and MOF-74(Ni)/TiO_2, were included in photovoltaics as the photoanode material. Photovoltaics that consist of MOF-74(Zn)/TiO_2 and MOF-74(Ni)/TiO_2 as photoanode materials demonstrated open circuit voltage (*V*oc) of 0.45 V and 0.36 V, short-circuit current density (*J*sc) of 0.18 mA cm^{-2} and 0.19 mA cm^{-2}, fill factor (*FF*) of 0.46 and 0.41, and percentage efficiency of 4.0×10^{-2} and 3.0×10^{-2}, respectively. According to *I-V* characteristics, shunt resistance (5.9 kΩ) of cells were found to be similar to that of a typical solar cell implying low manufacturing defects. However, series resistance is 10 times higher than that of a typical solar cell (0.4 kΩ) which may have resulted in low overall cell performances.

Financial assistance from the National Science Foundation (*Grant No. G/BS/2016/05*) *is acknowledged.*

Keywords: Metal-organic frameworks, Photoanode, Semiconductor, TiO_2