Optoelectronic applications of Mo_6 cluster

Keywords: molybdenum cluster, photoconductivity, optoelectronic

National Institute for Materials Science

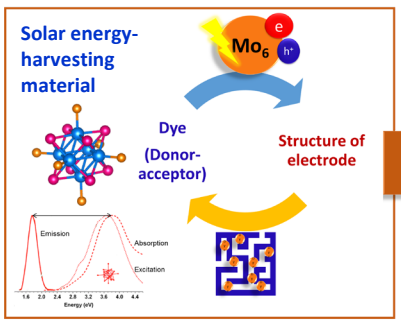
Back-ground

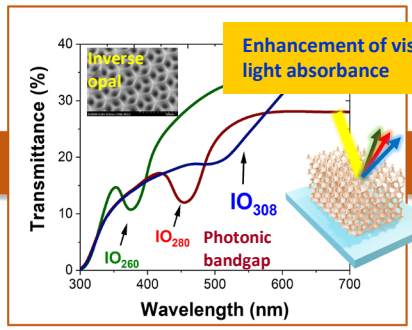
Solar energy-harvesting material has been evaluated as an important part of the development of energy-saving applications. Recently, the influence of light on the electrical properties of ionic conductors, so-called opto-ionic property, around room temperature has become a hot topic, crucial, and very promising for optical –relating devices.

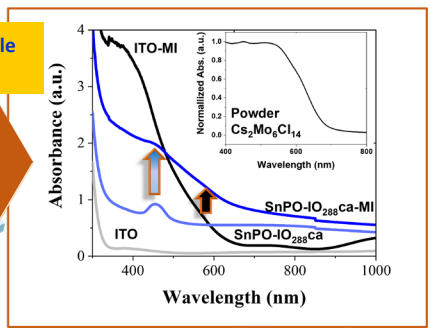
Aim

The electrophoretic deposition technique and inverse opal engineering were used for a combination of nanoarchitecture material (hexamolybdenum atom cluster) and ionic conductor, resulting in photo-induced electronic conduction properties which open a new opportunity for the cluster-based compounds in visible optoelectronic devices.

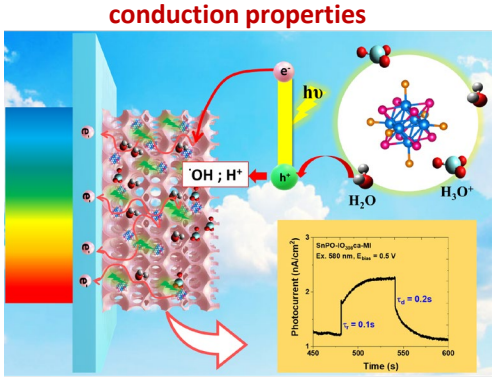
Advanced Research Topics



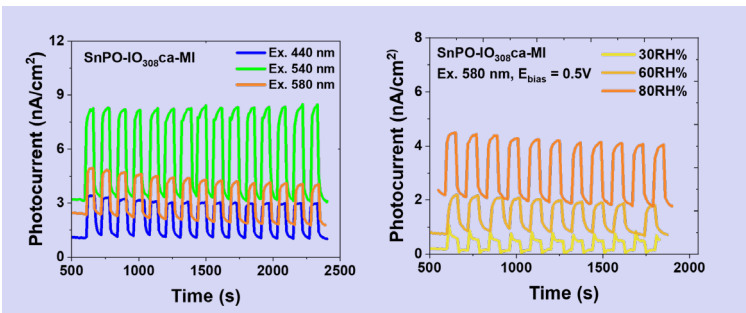




Tunable light-absorption and electronic conduction properties



Specific attention focused on the rule of humidity on the photosensitivity and reproducibility of photoresponse



Publications

- T. K. N. Nguyen et al., *J. Mater. Chem. C*, 5, 10477-10484, 2017.
- T. K. N. Nguyen* et al., *ACS Applied Materials & Interfaces*, 12, 40495-40509, 2020.
- K. Harada, T. K. N. Nguyen* et al., *NPG Asia Materials*, 14, 21, 2022.

Summary

- The photoactive Mo_6 clusters act as a visible light harvester (400-600 nm) and generate an efficient photo-induced current with rapid photoresponse characteristic that is enhanced by integrating with the inverse opal photonic bandgap.

Research outcome

- This study will contribute to the achievement of the Mo_6-based compound that can show an efficient photoconductivity response in the visible domain, an important characteristic for photoelectrodes of water splitting, photodetectors, and dyed-sensitized solar cells.

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