Au25 Gold Nanoclusters for enhancing Organic Cell Parameters

Abstract

Ultra small gold nanoparticles (GNPs) also called gold nano clusters (GNCs) because of their unique structure comprises of very few atoms and are capable of molecular level interactions by virtue of their molecule like properties. Introduction of GNCs to assist the transport layer of organic solar cells fetched higher current output as compared to cells with GNPs and cells with no gold at all. GNC devices showed a maximum efficiency enhancement by a factor of 1.74 to that of reference cell without gold. Faster electron-hole separation and movement towards
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respective electrodes leads to better efficiency and we suggest that electronic properties of GNCs enhance the action of transport layer PEDOT:PSS. But GNCs give more to the solar cell. They also allow more light to pass through them, thus, allowing more light to reach the active layer via transport layer, leading to increase in photocurrent resulting in overall parameter enhancement. It was evident with our experiments that single layer of GNCs provides double benefits of transport enhancement and absorption enhancement adding up to increased cell parameters and efficiency keeping the low cost advantage of organic solar cells intact.

References

- Roles of Au and Ag nanoparticles in efficiency enhancement of poly(3-octylthiophene)/C60 bulk heterojunction photovoltaic devices Kyungkon Kim1 and David L. Carroll1,a) Appl. Phys. Lett. 87, 203113 (2005); http://dx.doi.org/10.1063/1.2128062
- Plasmonic-enhanced polymer photovoltaic devices incorporating solution-processable metal nanoparticles Fang-Chung Chen1,2,a), Jyh-Lih Wu1,3, Chia-Ling Lee1,2, Yi Hong1,2, Chun-Hong Kuo4 and Michael H. Huang4 Appl. Phys. Lett. 95, 013305 (2009)
- Improving the efficiency of polymer solar cells by incorporating gold nanoparticles into all polymer layers Feng-Xian Xie1, Wallace C. H. Choy1,a), Charlie C. D. Wang1, Wei E. I. Sha1 and Dixon D. S. Fung1 Appl. Phys. Lett. 99, 153304 (2011)
- APL 2006 89 093103
- APL 2009 95 013305
- Nat. Mater. 2010, 9, 205-13
- Size dependence of spherical metal nanoparticles on absorption enhancements of plasmonic organic solar cells Inho Kim a,* , Kyu-Sung Lee b, Taek-Sung Lee a, Doo Seok Jung a, Wook-Seong Lee a, Won Mok Kim a, Kyeong-Seok Lee a Synthetic metals 199, 2015, 174-178
- Size Dependence of Atomically Precise Gold Nanoclusters in Chemoselective Hydrogenation and Active Site Structure Gao Li †, De-en Jiang †, Santosh Kumar †, Yuxiang Chen †, and Rongchao Jin * † ACS Catal., 2014, 4 (8), pp 2463–2469
- Fluorescent Gold Nanoclusters: Recent Advances in Sensing and Imaging Li-Yi Chen, Chia-Wei Wang, Zhiqin Yuan, and Huan-Tsung Chang* Anal. Chem. 2015, 87, 216-229
- Size Dependence of Atomically Precise Gold Nanoclusters in Chemoselective
Hydrogenation and Active Site Structure Gao Li †, De-en Jiang ‡, Santosh Kumar †, Yuxiang Chen †, and Rongchao Jin * † ACS Catal., 2014, 4 (8), pp 2463–2469
- Protein-directed synthesis of highly fluorescent gold nanoclusters Jianping Xie, Yuyang Zheng and Jackie Y. Ying JACS 2009 131 888-89
- Xie K JACS 2009 131 (3) 888
- turkevich et al
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