Abstract Submitted
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**Enhancement of solar absorption with black Cu2O Nanostructures**[1] HUI XING, JOHN HATCH, DENGXIN JI, KENNETH KORT, BIPLOB BARMAN, YU TSUNG TSAI, YUELING QIN, SARBAJIT BANERJEE, ATHOS PETROU, QIAOQIANG GAN, HONG LUO, HAO ZENG, SUNY at Buffalo — $Cu_2O$ is a direct gap semiconductor with a band gap of 2.1 eV. It was considered to be a solar absorber material, while the application is hindered by its large band gap and weak stability. Here we report an electrochemical synthesis of $Cu_2O$. By rationally control the synthetic parameters, we achieved two types of $Cu_2O$: one of black color and the other "normal" red $Cu_2O$. Both $Cu_2O$ films were in cubic phase and their crystal structures are almost identical as seen by X-ray diffraction. This is further corroborated by their nearly identical Raman spectra. The scanning tunneling spectrum (STS) revealed a gap in the red $Cu_2O$ around 2.1 eV and a significantly lowered gap of $\sim$ 1.7 eV in the black $Cu_2O$, indicating that the black color is caused by a change in the electronic structure. The reflectance and transmittance indicated a band gap of $\sim$ 1.7 eV for the black $Cu_2O$, with a significantly broadened absorption spectrum. While further effort is needed to understand the mechanism for the lowering of the band gap, we believe that our approach demonstrated means to promote earth abundant and nontoxic materials for potential photovoltaic applications through band gap engineering.

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