

Supporting Information –

Frequency-dependent photoconductivity (PC) spectra to show defect and near-band-edge transitions in $\text{ZnS}_{(1-x)}\text{O}_x$ with $x=0, 0.06$ and 0.12 .

The Study of Near-Band-Edge Property in Oxygen-Incorporated ZnS for Acting as an Efficient Crystal Photocatalyst

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PC Frequency Dependence

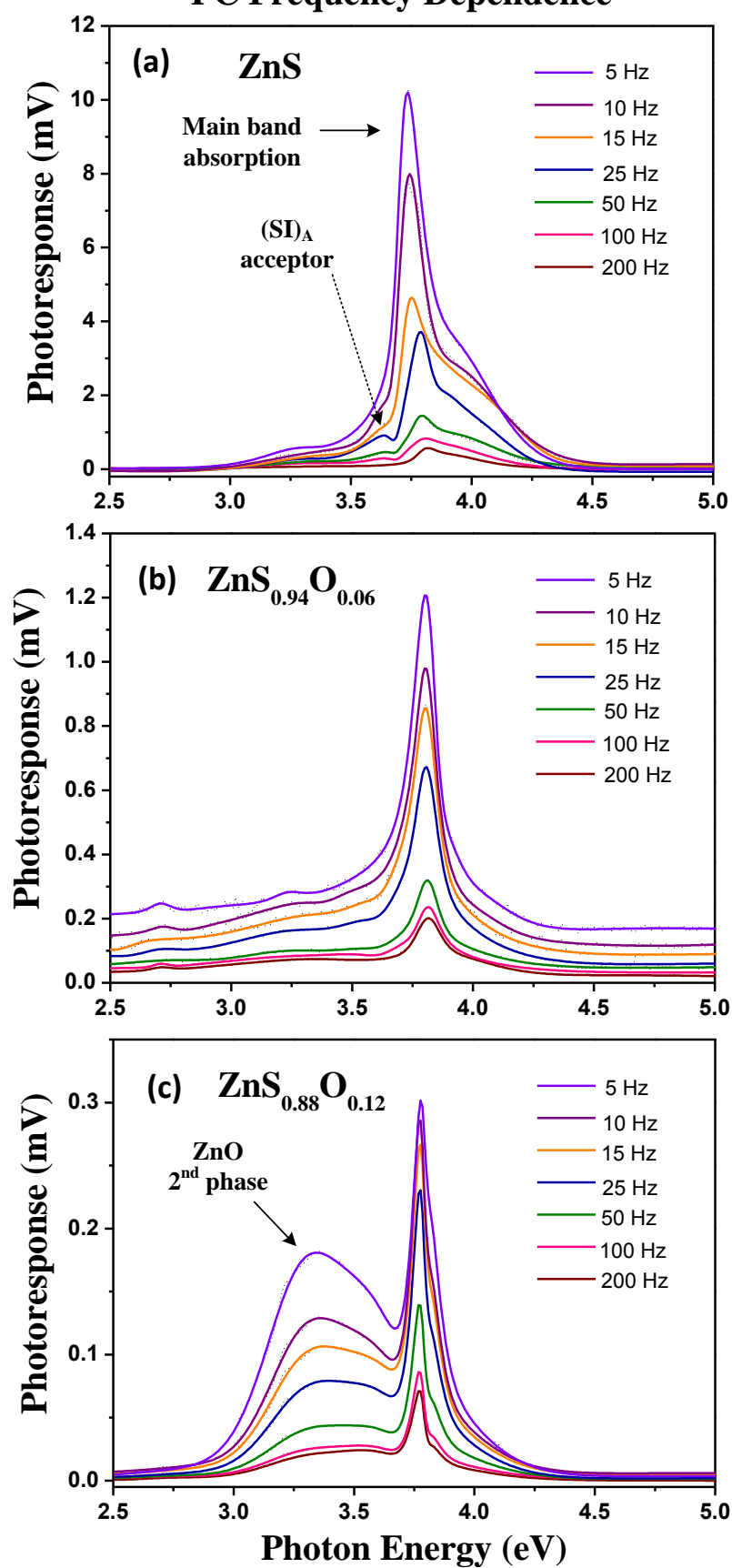


Figure S1. Frequency-dependent photoconductivity (PC) spectra of (a) undoped ZnS, (b) $\text{ZnS}_{0.94}\text{O}_{0.06}$, and (c) $\text{ZnS}_{0.88}\text{O}_{0.12}$ to observed the possible transitions of imperfection states and main-absorption band of $\text{ZnS}_{(1-x)}\text{O}_x$. As the chopped frequency of the incident light was increased from 5 to 200 Hz, the PC amplitudes of the ZnS, $\text{ZnS}_{0.94}\text{O}_{0.06}$, and $\text{ZnS}_{0.88}\text{O}_{0.12}$ were gradually decreased. At 25 Hz, the main band-edge absorption peak together with a clear below-band-edge transition [denoted as $(\text{SI})_A$] have been detected by the undoped ZnS sample. The below-band-edge transition $(\text{SI})_A$ is maybe coming from an acceptor level that caused by CVT-grown $\text{ZnS}_{(1-x)}\text{O}_x$ with I_2 as the transport agent. Besides, an obvious ZnO related peak at ~ 3.3 eV can also be detected in the highest oxygen-doped $\text{ZnS}_{0.88}\text{O}_{0.12}$ sample. It is owing to a second phase of ZnO was existed in the higher oxygen-incorporated $\text{ZnS}_{(1-x)}\text{O}_x$ crystals. All the PC measurement results are implemented tend to be the characterization of defect transitions in the oxygen-incorporated ZnS.