

## *Electronic Supplementary Information (ESI)*

### **Low recombination rates and improving charge transfer as decisive condition to high $J_{SC}$ and FF at ZnS complex system**

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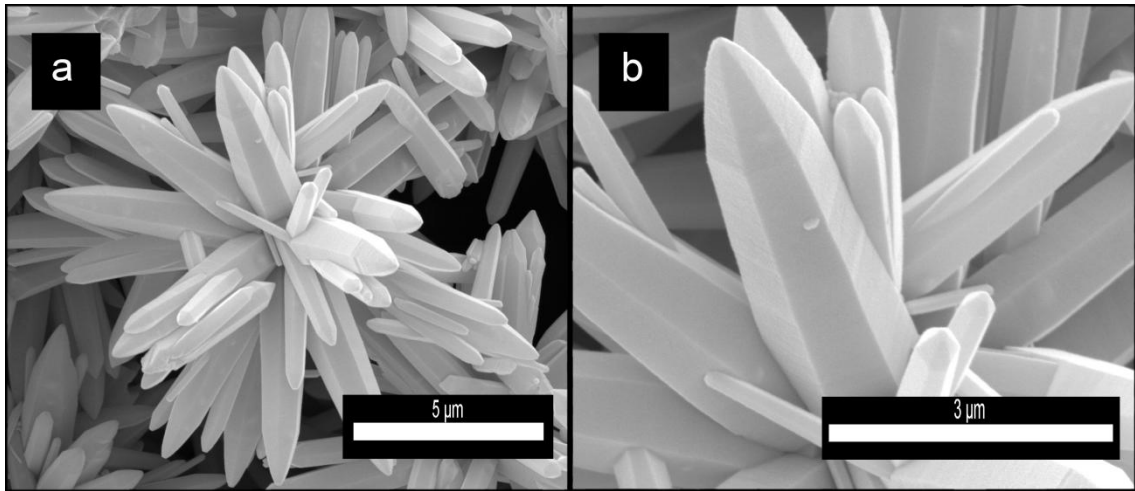


Figure S1: SEM-FEG images with magnification 20.0kX and 50.0kX of (a and b) ZnO, samples.

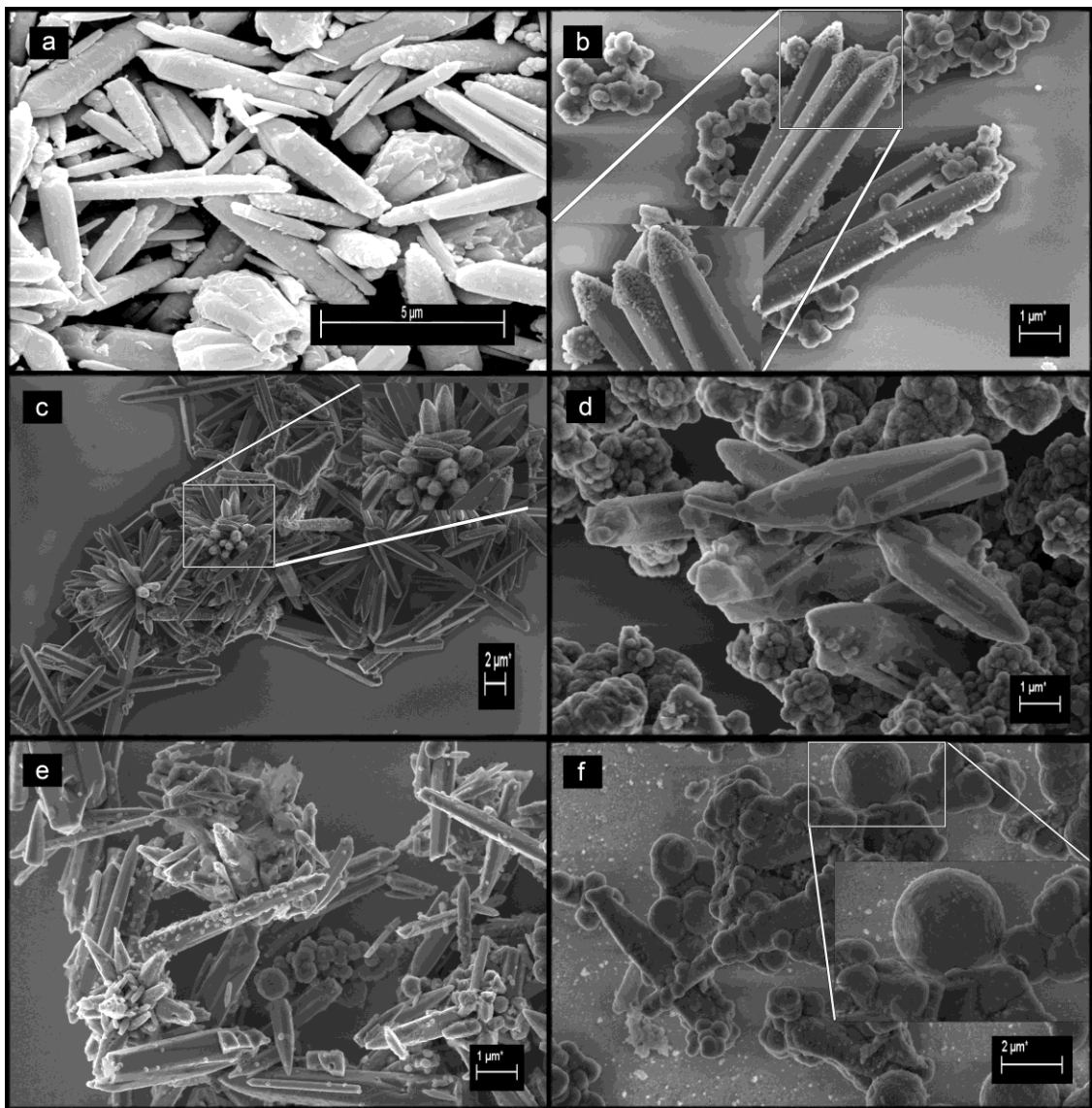


Figure S2: SEM-FEG image of the samples (a) ZnO/ZnS (ZA+TIO); (b) ZnO/ZnS (ZA+TAA); (c) ZnO/ZnS (ZN+TIO); (d) ZnO/ZnS (ZN+TAA); (e) ZnO/ZnS (ZC+TIO); and (f) ZnO/ZnS (ZC+TAA).