Supporting information:

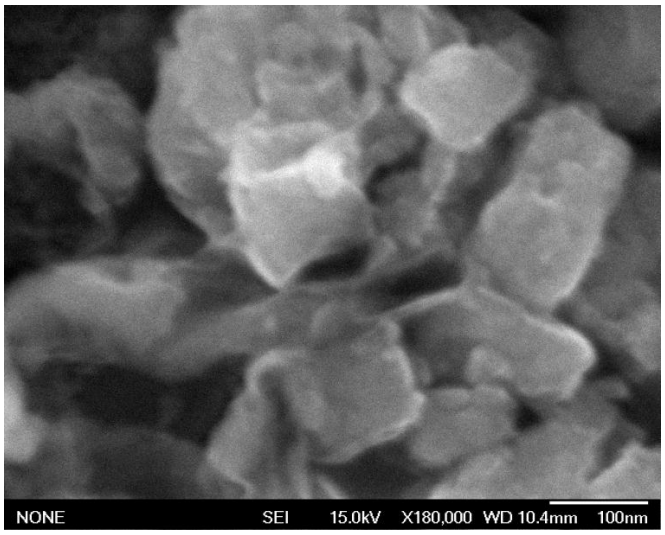

Figure S1. The morphology of the light scattering SnO_2 particles.

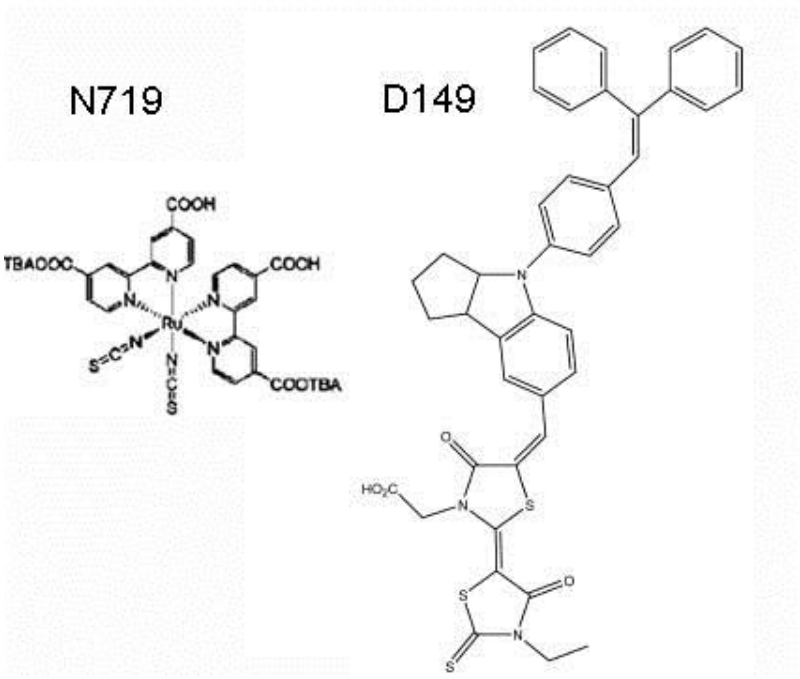

Figure S2. The chemical structures of N719 and D149.

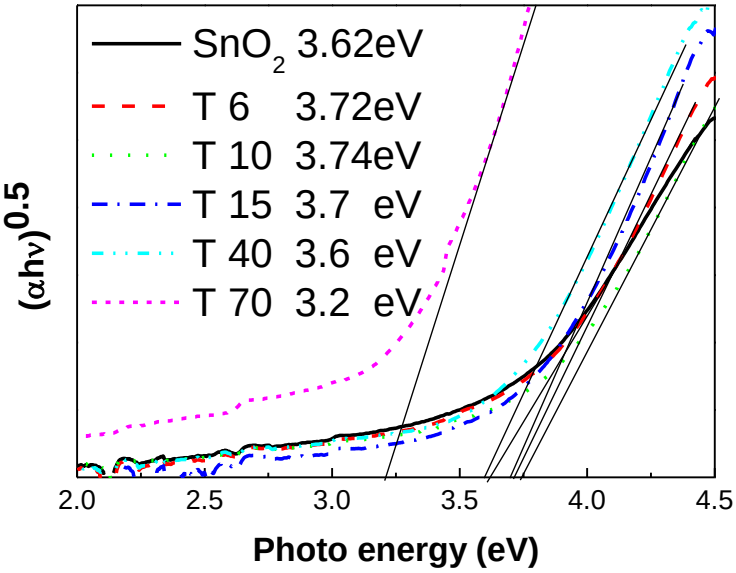

Figure S3. The curves of $(\alpha h\nu)^{\frac{1}{2}}$ versus of $Ti_xSn_{1-x}O_2$ photoanodes, the inset indicates the obtained indirect optical band gap energy.

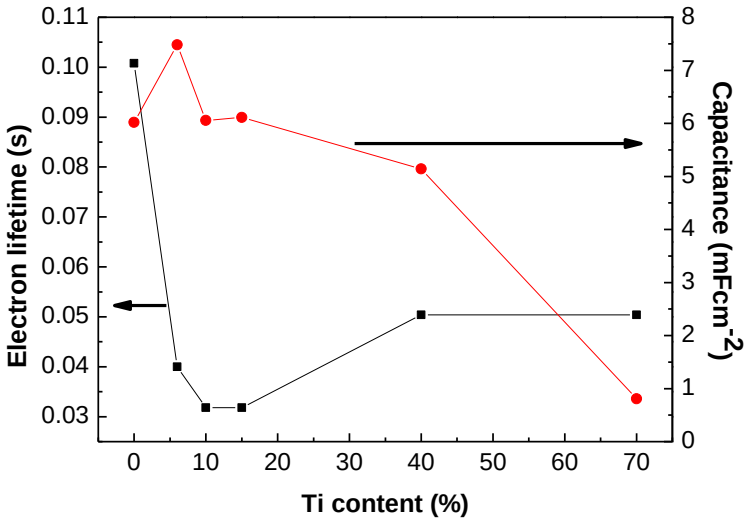

Figure S4. The electron lifetime of DSSCs and capacitance of $Ti_xSn_{1-x}O_2$ photoanodes measure by EIS.

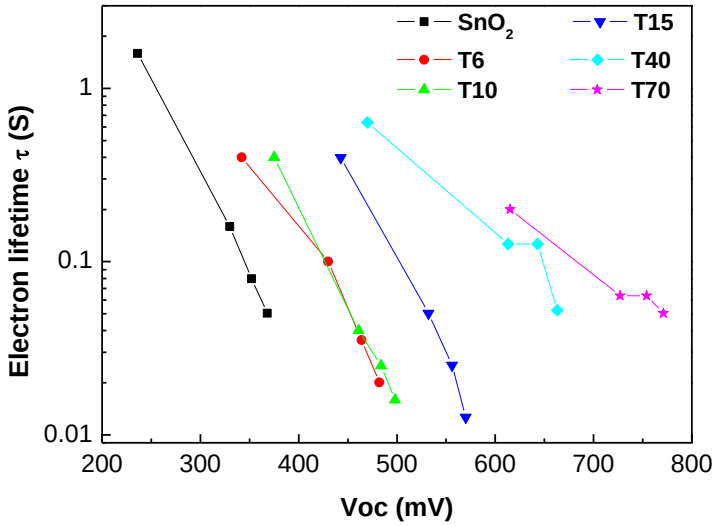

Figure S5. The variation of electron lifetime with photovoltage of DSSCs under different light intensities.

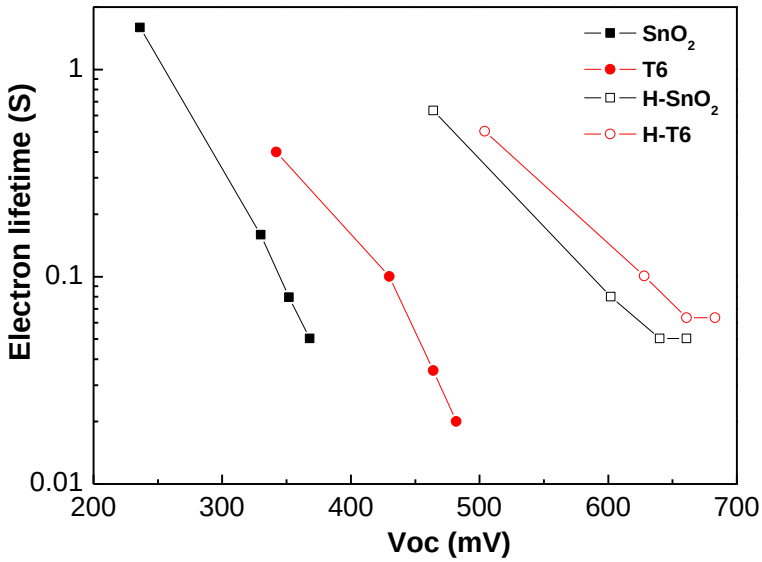

Figure S6. The electron lifetime of SnO_2, T6, the hybrid photoanode H-SnO_2 and H-T6 under different photovoltages.