Supporting information:

Figure S1. The morphology of the light scattering SnO\textsubscript{2} particles.

Figure S2. The chemical structures of N719 and D149.
Figure S3. The curves of \((\alpha\hbar)^{0.5}\) versus of Ti\(_x\)Sn\(_{1-x}\)O\(_2\) photoanodes, the inset indicates the obtained indirect optical band gap energy.
Figure S4. The electron lifetime of DSSCs and capacitance of Ti$_x$Sn$_{1-x}$O$_2$ photoanodes measure by EIS.

Figure S5. The variation of electron lifetime with photovoltage of DSSCs under different light intensities.
Electron lifetime (S)
Voc (mV)

Figure S6. The electron lifetime of SnO$_2$, T6, the hybrid photoanode H-SnO$_2$ and H-T6 under different photovoltages.