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Electronic Supplementary Information

Probing into Highly Transparent and Conducting SnO_x/Au/SnO_x Structure for Futuristic TCO Applications

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Energy Dispersive Spectroscopy (EDS) analysis

The elemental estimation by energy dispersive X-ray spectroscopic (EDS) analysis was performed on stacked multilayer of SnO_x/Au/SnO_x using Nova Nano FESEM 450 (FEI). The estimation is provided below as fig. S1 and fig. S2 indicating the elemental information from stacked multilayer. Fig. S1 incorporates the contribution of Si from quartz substrate while fig. S2 shows the elemental information after ignoring Si element. The results are tabulated as table S1 and table S2 in the similar fashion to quantify the relative concentration of each element in the stacked multilayer. Herein the relative contribution could not be used for exact estimation of Au concentration in stacked multilayers since the exact oxygen estimation is not possible employing EDS [1].

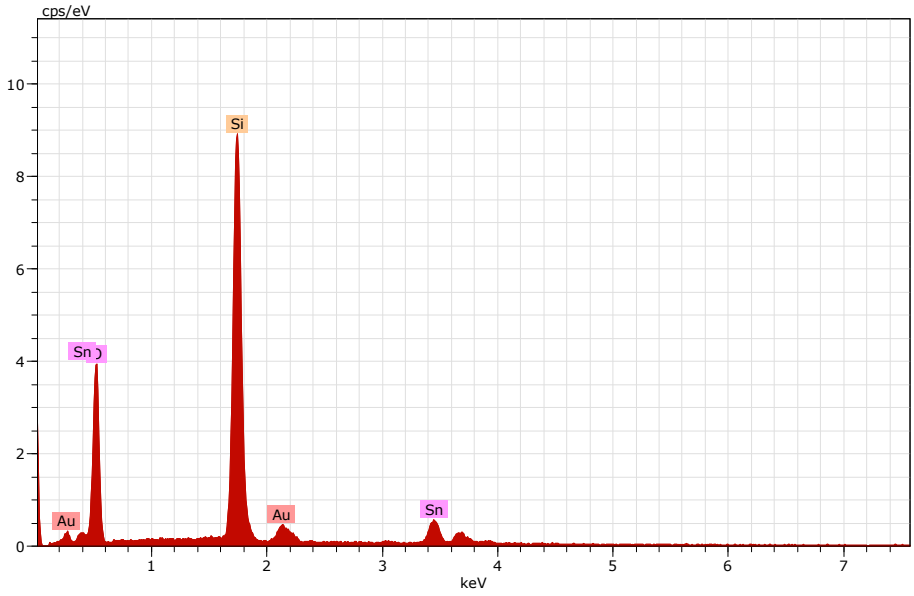

Fig. S1 EDS spectrum showing the peaks corresponding to different elements of constituent layer and substrate

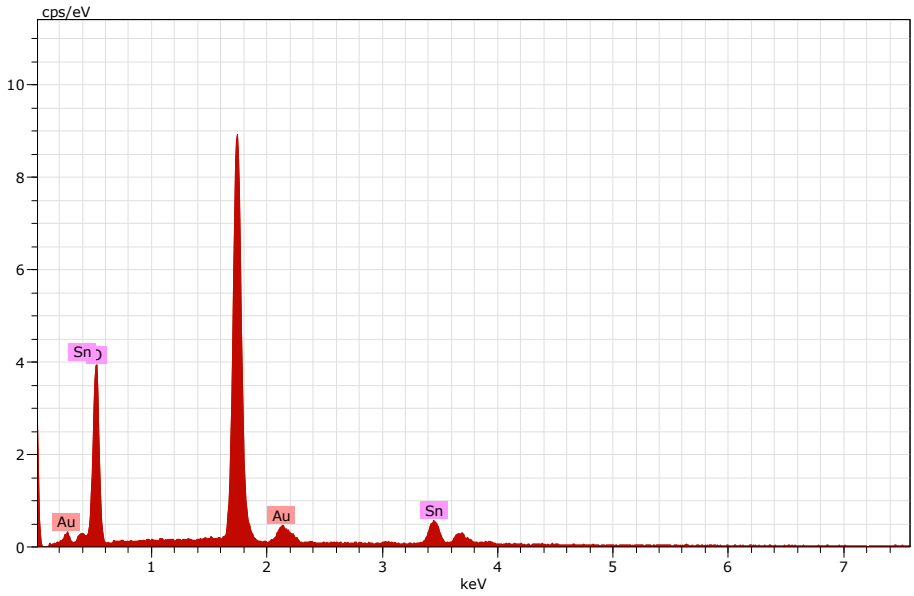

Fig. S2 EDS spectrum showing the peaks corresponding to different elements of constituent layer (after elimination of Si from the substrate)

Table S1 Table showing estimation of elements of stacked multilayer of SnO_x/Au/SnO_x

Element	Atomic number	Series	Normalized (weight percentage)	Normalized (atomic percentage)
O	8	K-series	50.30	69.55
Si	14	K-series	35.60	28.04
Sn	50	L-series	11.11	2.07
Au	79	L-series	2.99	0.34

Table S2 Table showing estimation of elements of stacked multilayer of SnO_x/Au/SnO_x after ignoring Si element

Element	Atomic number	Series	Normalized (weight percentage)	Normalized (atomic percentage)
O	8	K-series	79.30	96.92
Sn	50	L-series	15.66	2.58
Au	79	L-series	5.03	0.50

The photoluminescence (PL) spectrum was recorded using a custom made PL setup employing a 325 nm laser as excitation source coupled with appropriate filter and data collection software. The following PL spectrum was obtained which exhibited a sharp UV peak at 381 nm (~3.27 eV) corresponding to direct band to band transition [2]. Further a broad region in the visible region (390 nm -578 nm) is obtained which is normally attributed to the oxygen vacancies in the SnO_2 [3].

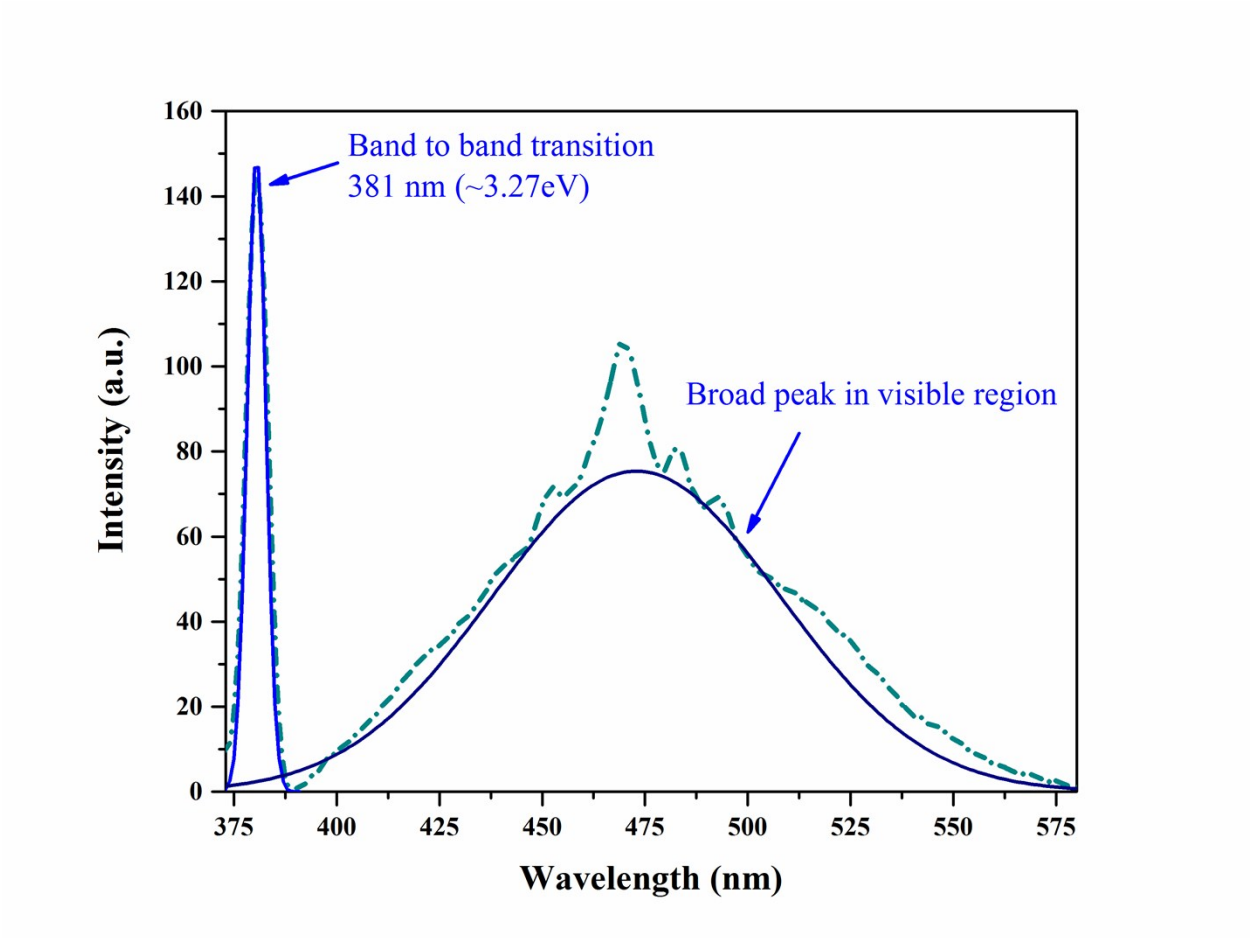

Fig. S3 Photoluminescene spectrum of staked multilayer showing a sharp peak at 381 nm and a broad peak between 390 nm to 578 nm

The current-voltage characteristics of the stacked multilayered film were recorded at various temperatures in two point mode by sourcing of voltage and measurement of current. The resulting plot is shown below in fig. 2 which is indicative of the ohmic behavior and stability of the multilayered structure in temperature range 100 K to 300 K.

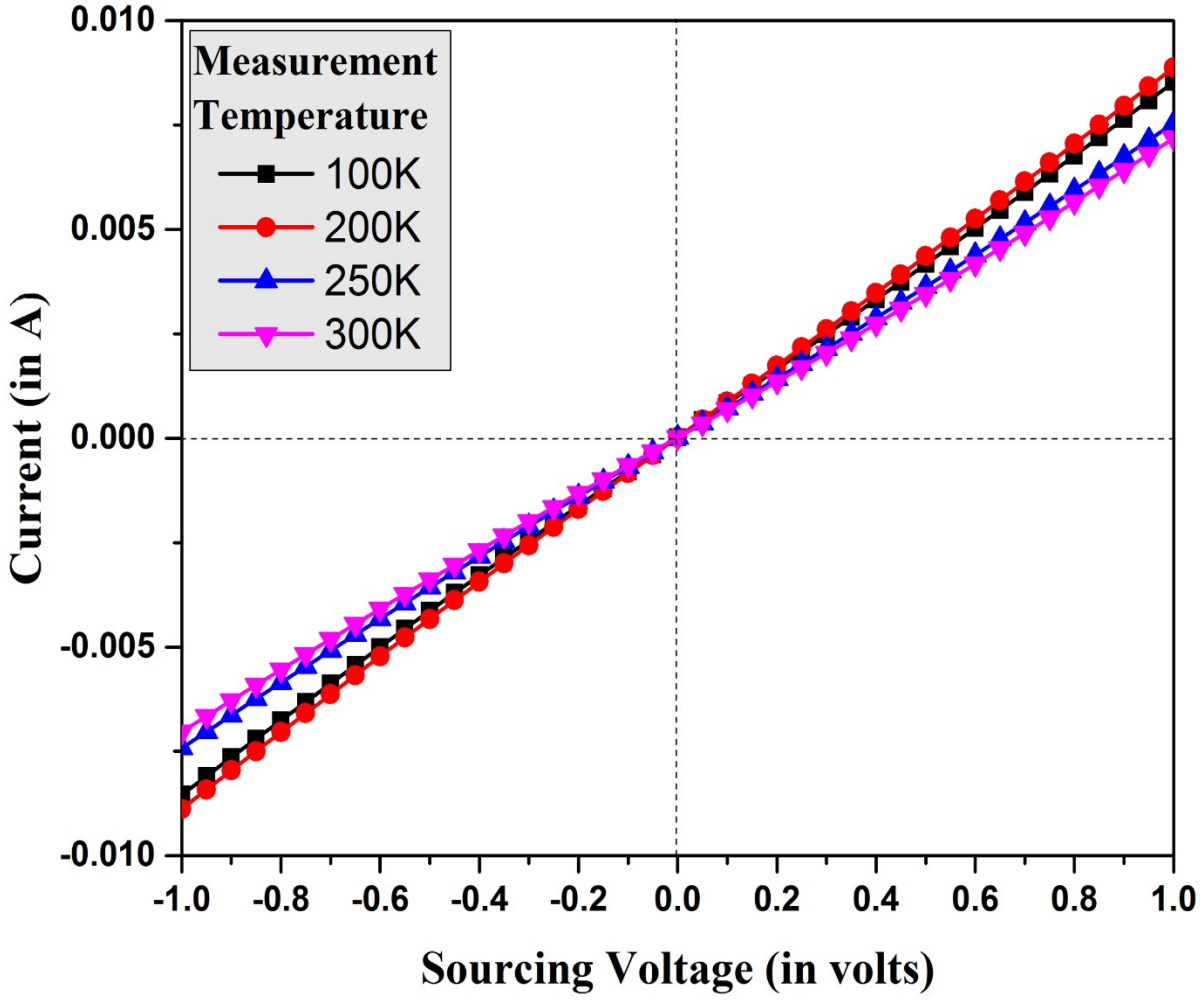

Fig. 4S Current-voltage characteristics of the stacked multilayer film in two point mode in the temperature range 100-300K

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