Supplementary Information

Experimental evidence of wide bandgap in triclinic (001)-oriented $Sn_5O_2(PO_4)_2$ thin films on Y_2O_3 buffered glass substrates

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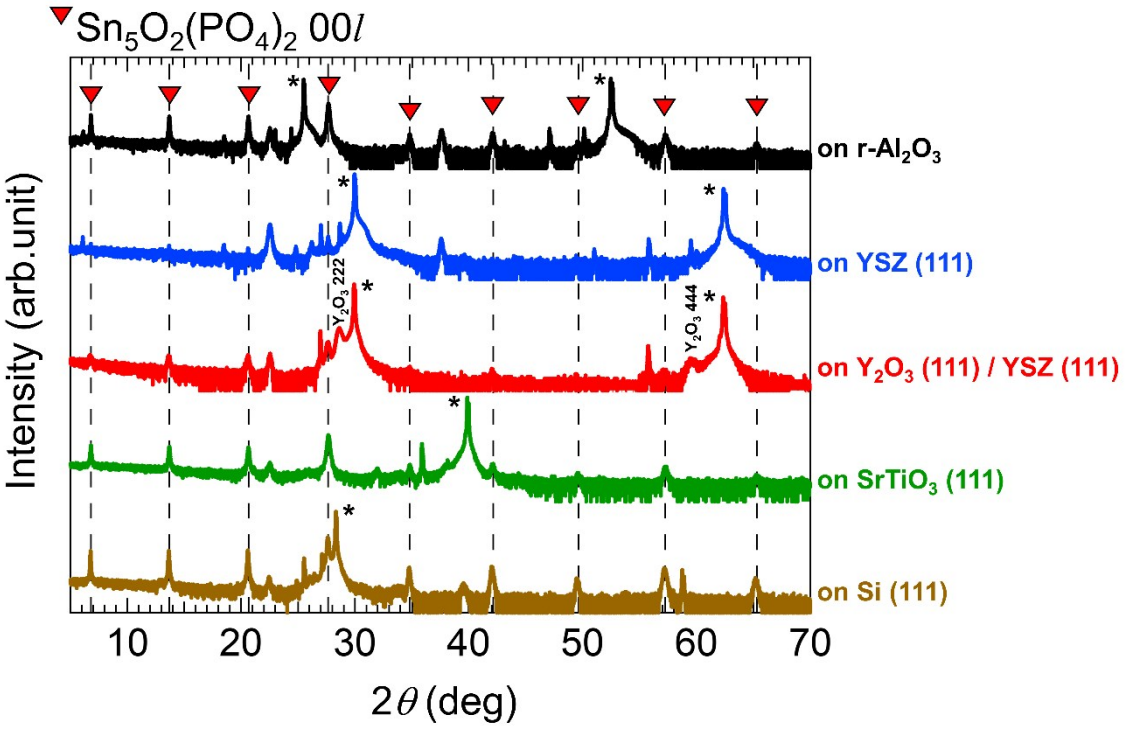

Fig. S1 θ-2θ XRD pattern of $Sn_5O_2(PO_4)_2$ films grown at 565 °C on various substrates. The asterisks indicate substrate peaks.

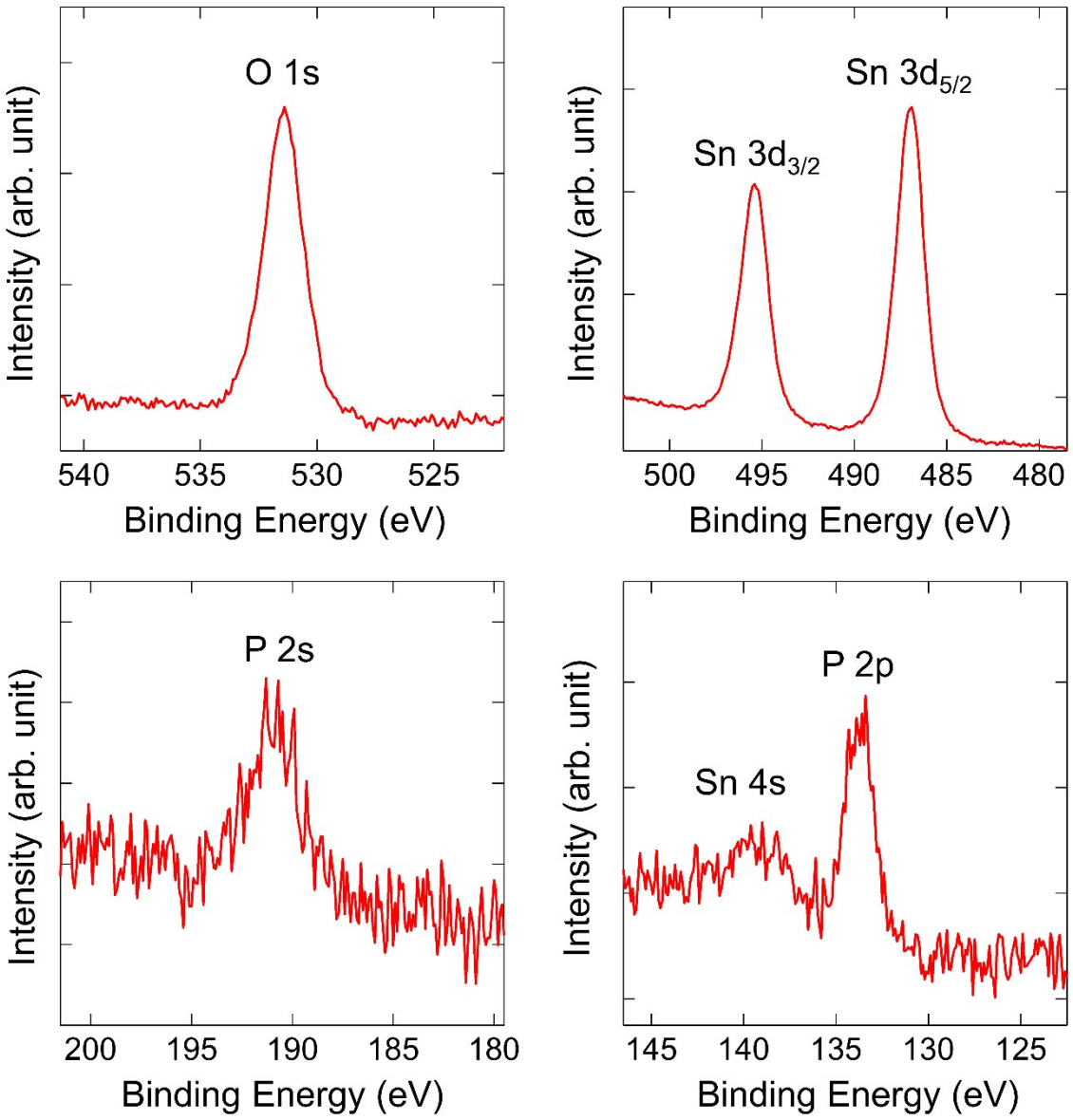

Fig. S2 Photoemission spectra of O 1s, Sn 3d, P 2s and P 2p of the $Sn_5O_2(PO_4)_2$ film measured by Al K_α excitation.

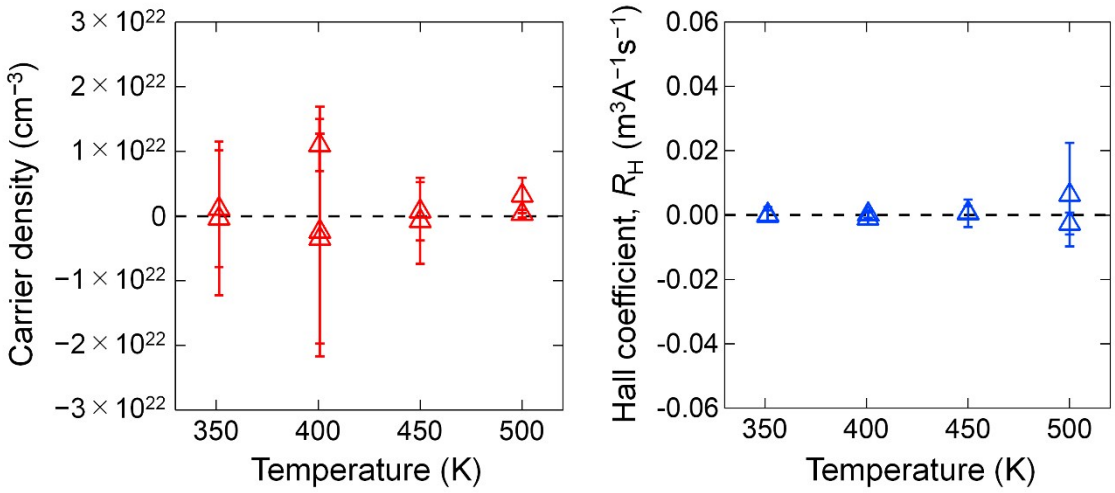

Fig. S3 Temperature dependence of carrier density and Hall coefficient (R_H) for the $Sn_5O_2(PO_4)_2$ film measured by Physical Property Measurement System. Negative carrier density and positive R_H indicate the existence of p-type carriers in the sample. The experimental errors were too large to determine the carrier type of the $Sn_5O_2(PO_4)_2$ film.