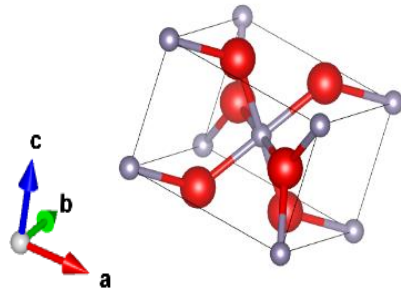


Crystal structure and physical properties of SnO_2 and SnO

SnO_2

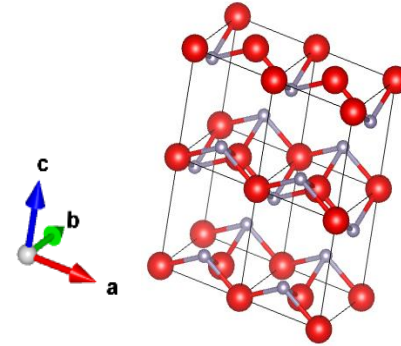


ion radius (Å)

- Sn^{4+} : 0.71
- O^{2-} : 1.32

Optical band gap
3.57 eV (parallel)
3.93 eV (vertical)

SnO

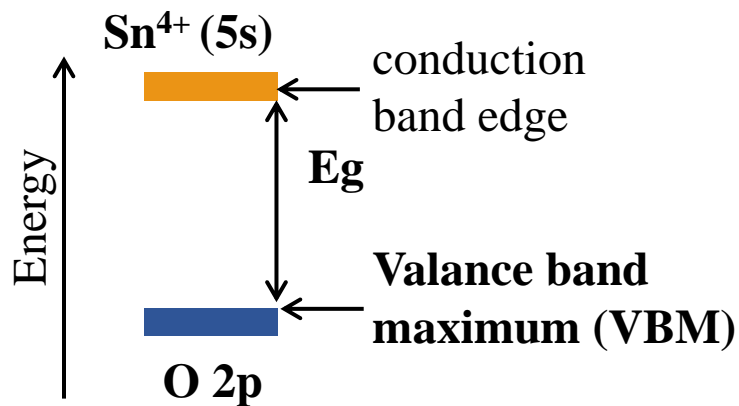


ion radius (Å)

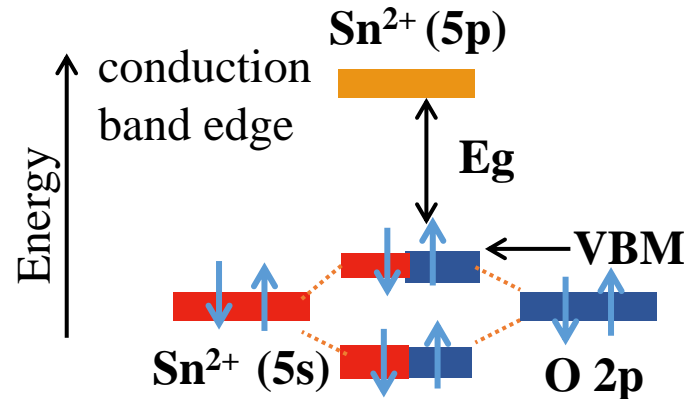
- Sn^{2+} : 0.93
- O^{2-} : 1.32

Optical band gap
2.7 eV (direct)
0.7 eV (indirect)

The band structure of SnO_2
(Localized valence band orbitals)

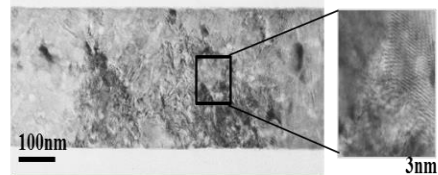


The band structure of SnO
(Delocalized balance band orbitals)

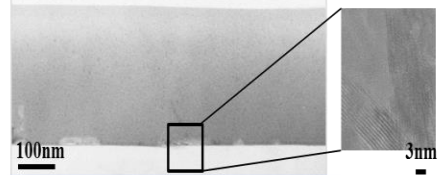


Result: Transmission Electron Microscopes (TEM)

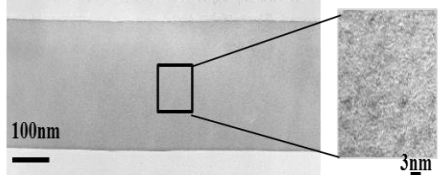
Bright-field images



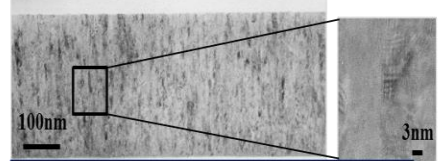
S-4 Cathode Voltage: 456V SnO



S-3 Cathode Voltage: 453V

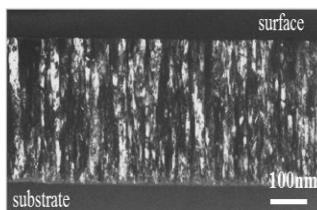
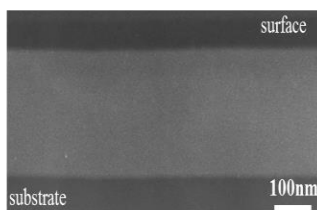
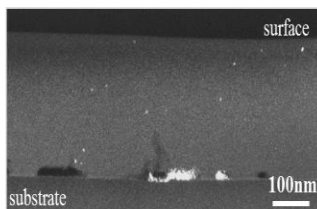
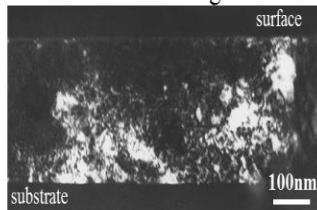


S-2 Cathode Voltage: 418V

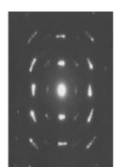


S-1 Cathode Voltage: 398V SnO₂

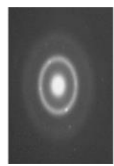
Dark-field images



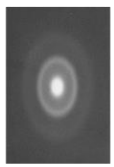
Electron beam diffraction images



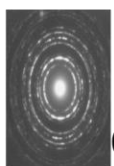
Polycrystalline pattern



Amorphous pattern + Microcrystalline pattern



Amorphous pattern



Polycrystalline pattern

Metal

Oxide

Dark-field images

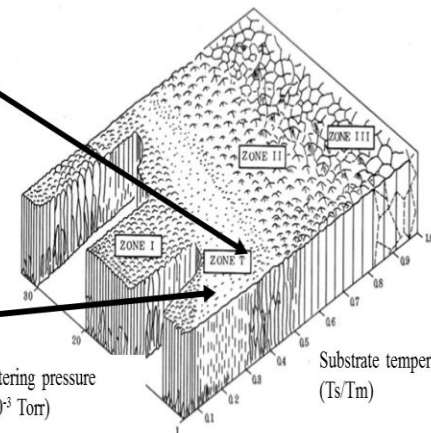
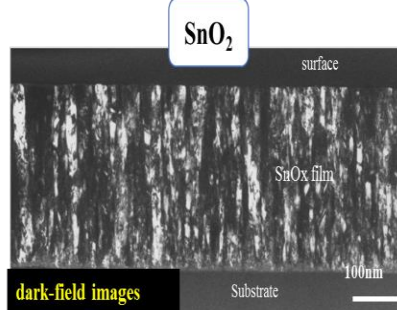
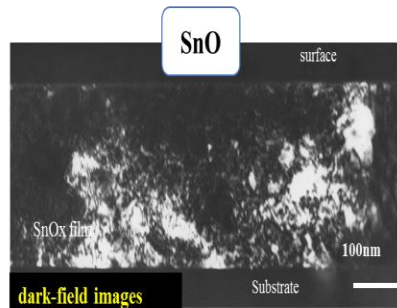


Table. Melting point of SnO_x thin films

	Melting point [K]
SnO ₂	1903 [4]
SnO	1353 [4]

Thornton model [5]

$$T_s/T_m = 0.25 \text{ Zone-I}$$

$$T_s/T_m = 0.35 \text{ Zone-II}$$