

11<sup>th</sup> International Conference on

# ADVANCED MATERIALS & PROCESSING

September 07-08, 2017 | Edinburgh, Scotland

## Transparent semiconductors: Synthesis, properties and applications

**Hao Gong**

National University of Singapore, Singapore

In many applications such as special-effect advertisement and displays on window glass, optically transparent or invisible electronics are needed. Transparent oxide semiconductors (TOSs) are fundamentally important for realizing such advanced applications. To be transparent optically, the material needs to be of wide band gap of 3 eV and above. Such a wide gap is typically for an insulator, as conducting metals have almost no band gaps. Therefore, it is necessary to generate shallow level defects serving as donor or acceptor for making the material conductive. One of the most challenging and difficult parts of the TSOs work is the fabrication of highly conductive p-type TSOs and compound semiconductors, whose success can lead to new generation devices and applications. The p-type TSOs we have fabricated successfully include Cu-Al-O, ZnO, and Cu<sub>2</sub>O, etc. The n-type TSOs and TCOs we have successfully fabricated include nanostructured or/and amorphous ZnO, SnO<sub>2</sub>, IZO (indium zinc oxide), and ITO (indium tin oxide) thin films. Transparent p-n junction diodes have also been succeeded and investigated. In this talk, I will introduce transparent semiconductor, and use indium zinc oxide, zinc oxide, copper aluminum oxide as example to introduce various concept and parameters affecting optical transmittance and electrical conductance. The fabrication of the material will be introduced. Various characterization methods will be described for the determination of different important parameters. The properties of the material prepared under different conditions will be analyzed and discussed.

msegonh@nus.edu.sg