Optoelectronics Function Development Group

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Research field: Transparent Electro-active Oxides

Research topics to be conducted in the G-COE project

Cultivation of transparent oxide semiconductors

We have started the cultivation by exploring p-type transparent conductive oxides and realized UV-LED in 2000. A promising application of transparent amorphous semiconductors (TAOS) is now being expected as high performance transistor applicable for backplane of OLED displays and active matrix-type e-paper displays. In this project, we focus on;

(1) exploration of electro-active functionality in light metal oxides, which are believed to be typical insulators.

(2) establishment of co-doping concept of rare-earth ion in amorphous SiO_2.

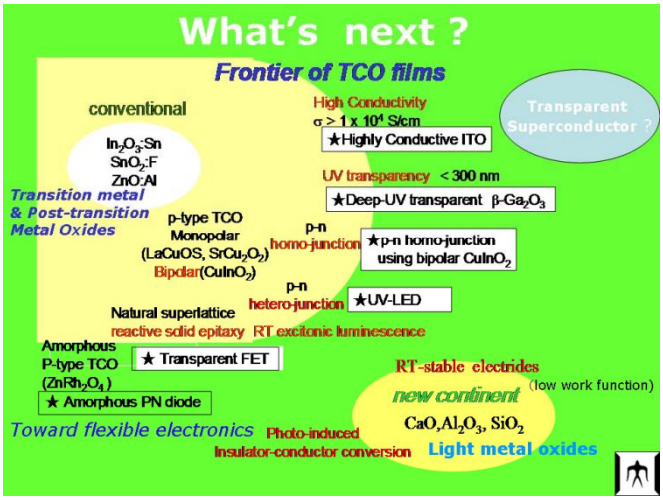
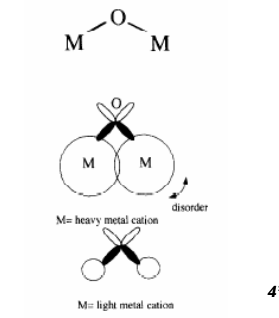
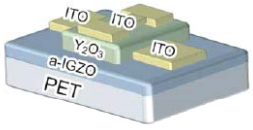


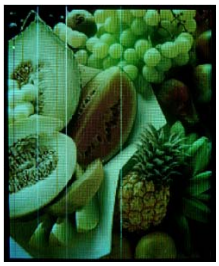
Fig.1. Current status of transparent oxide semiconductors cultivated by our group.



TAOS-Proposal, ICAMS 1995



TAOS-TFT, Nature,2004



4' AM-OLED based on TAOS-TFT ,SID 2007(LG)

4 inch front-driven structure e-paper using TAOS-TFT , IDW'06 (Toppan)

Fig.2. Transparent amorphous oxide semiconductors (TAOS): from material concept to display applications

Representative publications

J.Non-Cryst.Sol. (1995) Proposal of TAOS
Nature (1997). First P-type transparent oxide semiconductor
Nature (2002) Electrocondictive C12A7
Phys.Rev.Lett(2002). Modified SiO_2 for VUV
Science (2003). High performance TOS-TFT
Science (2003) RT-stable Electride
Nature (2004). TAOS-TFT
Nature Mater. (2007) Giant TE response due to 2D electrons
JACS (2007) C12A7:e^- superconductor