Modulation of Carrier Density in Indium-Gallium-Zinc-Oxide Thin Film Prepared by High-Power Impulse Magnetron Sputtering

一.成果完成人及所在单位：陈祚株，徐新浩，朱润峰，光电与通信工程学院

指导教师：赵铭杰

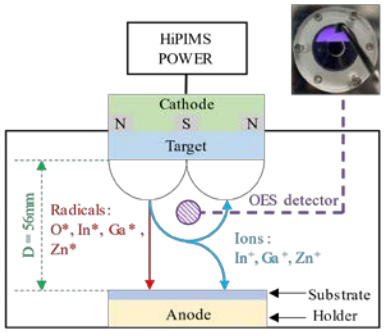
二.成果简介：

Amorphous indium-gallium-zinc-oxide (α-IGZO) have been used as the channel material of thin-film transistors (TFTs) owing to the high electron mobility and good electric uniformity. α-IGZO thin film prepared by High-Power Impulse Magnetron Sputtering (HiPIMS) can make good coverage on high-aspect-ratio substrate, which is essential as the dimensions of TFTs are scaling down. However, the carried density in α-IGZO film prepared by HiPIMS is usually too high for TFT application. This work aims at suppressing the carried density in HiPIMS-IGZO to meet the requirement of TFT application.

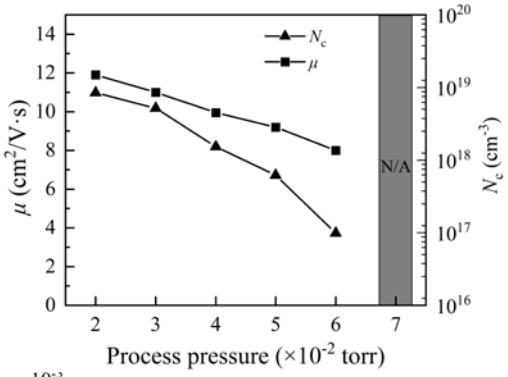
三. 主要研究内容及创新点：

1. Amorphous IGZO thin films were prepared by high-power impulse magnetron sputtering.
2. The factors that influencing the film composition were discussed. The highest sputtering yield, least collision scattering and lowest self-sputtering yield of Zn species lead to Zn-rich film.
3. The carrier-density in the thin film was modulated by the process pressure.
4. The switch characteristics of the TFTs were modulated by the pressure during the preparation of IGZO channel.

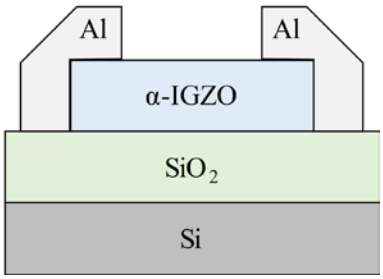
Film Deposition Mechanism



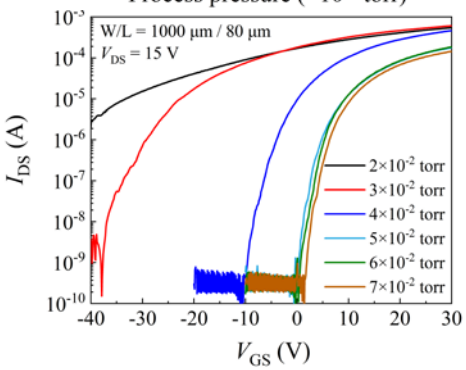
Carrier density & Mobility



TFT Structure



TFT Characteristic



四. 主要研究成果及应用情况

已被期刊《Vacuum》接收学术论文一篇（SCI 收录，中科院二区），论文题目：《Modulation of carrier density in Indium-Gallium-Zinc-Oxide thin Film prepared by High-Power Impulse Magnetron Sputtering》

学生作者：陈祚株；指导老师：赵铭杰

联系人：陈祚株　　电话：15750716956　　Email：2022031141@s.xmut.edu.cn