TT-P012

Metal Grids Embedded Transparent Conductive Electrode with Flexibility and Its Applications

Sunghoon Jung, Seunghun Lee, Jong-Kuk Kim, Jae-Wook Kang, Do-Geun Kim

Korea Institute of Materials Science

Recently, flexibility is one of the hottest issues in the field of electronic devices. For flexible displays or solar cells, a development of transparent conductive electrodes (TCEs) with flexibility, bendability and foldability is an essential element. Hundreds of nanometers indium-tin-oxide (ITO) films have been widely used and commercialized as a transparent electrode, but their brittleness make them difficulty to apply flexible electronics. Many researchers have been studying for flexible TCEs such as a few layers of graphene sheets, carbon nanotube networks, conductive polymer films and combinations among them. Although gained flexibility, their transmittance and resistivity have not reached those of commercialized ITO films. Metal grids electrode cannot act as TCEs only, but they can be used to lower the resistance of TCEs with few losses of transmittance. However, the possibility of device shortage will be rise at the devices with metal grids because a surface flatness of TCEs may be deteriorated when metal grids are introduced using conventional methods. In our research, we have developed hybrid TCEs, which combined tens of nanometers ITO film and metal grids which are embedded in flexible substrate. They show 13 Ω/□f sheet resistance with 94% of transmittance. Moreover, the sheet resistance was maintained up to 1 mm of bending radius. Also, we have verified that flexible organic light emitting diodes and organic solar cells with the TCEs showed similar performances compared to commercial ITO (on glass substrate) devices.

Keywords: Flexible, Metal grid, Transparent conductive electrode