Highlystretchable and ultrasmooth silver nanowire embedded electrode for stretchableorganic light-emitting diodes (SOLEDs)

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Stretchableelectronics has been recognized as a key technology for realizing next generationelectronic technology. Recently, stretchable organic light-emitting diodes(SOLEDs) would enable expandable and stretchable screens for smartphones,wearable or fashionable electronic devices, collapsible or rollable for rubber-likeilluminations. Silver nanowire (AgNW) is a great candidate for a stretchableelectrode due to the fact that once a percolation network forms among AgNW, thenetwork does not break easily under stretching because of the high aspect-rationanowires. However, because the rough surface of AgNW coating is likely tocause short circuits in the devices, its surface morphology posed a majorchallenge to its application in wearable electric devices. The roughness of thedeposited AgNW networks on a flat substrate is intrinsically large; thepeak-to-peak roughness is more than twice the diameter of the wires, because ofthe random arrangement of networks through stacking of the wires.

In this study, wehave demonstrated that a highly stretchable electrode with superior mechanical,electrical properties can be fabricated by embedding the AgNW film into the polyurethanematrix. This technique can produce electrodes with an ultrasmooth stretchableelectrode that have sheet resistance comparable to those of an indium–tin–oxide(ITO) electrode.

This study was supported by \"Development of core technologies on materials, devices, and processes for TFT backplane and light emitting frontplane with enhanced stretchability above 20% with application to strechable display (PGM9500)\" project.