

Terahertz Spectroscopy of Metal-Insulator Transition in Silver Nanowire Films.

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Highly transparent, but still conducting electrode films are crucial for many optoelectronic devices. Indium-tin-oxide (ITO) is the most widely used transparent conducting metal oxide, but its poor physical properties make ITO unlikely to be the material of flexible optoelectronic devices. Among several candidates to replace ITO, Ag nanowire (AgNW) thin film shows the potential for realization of cheap, flexible, and transparent electrodes. Meanwhile there is a tradeoff between transparency and conductivity and it is crucial to determine the optimum NW density for the best performance of AgNW-based devices. Terahertz (THz) spectroscopy has been extensively used in characterization material properties of various materials, especially nanostructured materials. In THz spectroscopic study on AgNW films, we found that conductivity of AgNW undergoes a transition from non-conducting to conducting phase as the NW density increases. The percolation threshold, which corresponds to the critical density of conductivity transition, was unambiguously determined. This result shows an excellent agreement with that obtained from the morphological analysis