Enhanced Photoresponse of VO_2 Nanowires by Surface Doping with AuNPs via Dielectrophoresis Method

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The recent advancements in synthesizing single crystalline one-dimensional (1D) nanostructures of vanadium dioxide (VO_2) in the form of nanowires (NWs) have sparked increased research interest for application in electrical and optical switching devices [1-3]. In this study, we examine the photocurrent response in VO_2, a highly correlated material that is well-known for its significant metal-insulator transition at a temperature of around 340 K [3-4]. This property makes VO_2 potentially valuable for applications in optoelectronic detection and switching, particularly for UV wavelengths. The investigation included the examination of individual and isolated VO_2 NWs photocurrent response before and after gold nanoparticles (AuNPs) surface deposition via the dielectrophoresis (DEP) method. Carrier injection is controlled by manipulating the presence of AuNPs on the surface of a single crystal VO_2 NWs. The VO_2 NW device exhibited an enhanced photocurrent after AuNPs surface deposition. Our study demonstrates the significance of using AuNPs deposition via the DEP process for the enhanced photocurrent response to analyze nanoscale crystals in the study of highly correlated materials for thermoelectric and optical applications [5-6].

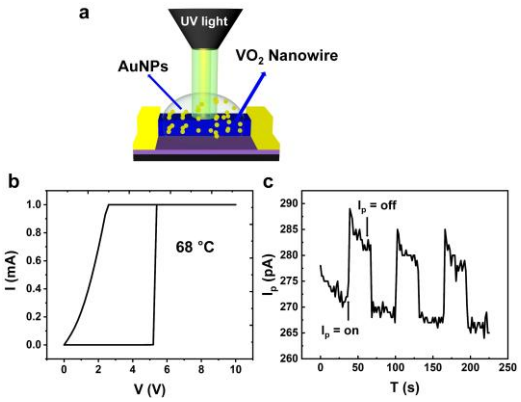

Fig.1. a) A schematic diagram of a VO_2 nanowire device. b) Metal-insulator transition of the VO_2 NW device at temperature 68 °C. c) Photoresponse of VO_2 NW device after AuNPs surface deposition.

References

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