The Current Transport Characteristics of Ti/ZnO Nanowire Schottky Diode at High Temperatures

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In the present work, we report current transport characteristics of Ti/ZnO nanowire Schottky diode at high temperatures. ZnO nanowires (NWs) were grown onto p-type Silicon (Si) via thermal evaporation process by using metallic Zn powder in the presence of oxygen. To fabricate Ti/ZnO nanowire Schottky diode, we define two-terminal Ti/ZnO contact configurations along the length of selected ZnO nanowires (NWs) by using Raith ELPHY Plus (Raith GmbH) electron beam lithography (EBL). Typical spacing between contacts was 2 ~ 4 μm. ZnO nanowire Schottky diodes have been investigated by means of I-V characterization technique at various temperatures between 297 and 417 K. It is found that the ideality factor n of the diode decreases with increasing temperature and Schottky barrier height (SBH) increases with increasing temperature. The corresponding SBH increases all through the temperature range. A thermal emission (TE) model with a Gaussian distribution of SBHs explained though ZnO nanowire to responsible for the electrical behavior at temperature 297 ~ 417 K. the effective Richardson constant is determined to be 32 A cm^{-2} K^{-2} in the theoretical value. ZnO nanowires contacted by Ti/Au can serve as the future devices.