Ohmic contact resistance from Ti/Au structure of ZnO nanowire

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We report transport properties of pure and doped single ZnO nanowire (NW) based on the transmission line matrix (TLM) method, which describes current transport at the metal/semiconductor interface. First, pure and Al, Sn, Mg-doped ZnO nanowires (NWs) were grown onto p-type Silicon (Si) via thermal evaporation process by using metallic Zn, Al, Sn, and Mg powder in the presence of oxygen. To fabricate Ohmic contact, we define two- and four-terminal contact configurations along the length of selected ZnO nanowires (NWs) by using Raith ELPHY Plus electron beam lithography. Typical spacing between contacts was 2 ~ 4 μm. Multiple contacts are applied to the pure and doped nanowire (NW) which enables the investigation of the uniformity of the conducting channel. The specific contact resistance of the Ti/Au (50/120 nm) electrodes to the pure and Al, Sn and Mg-doped ZnO nanowires (NWs) are determined experimentally by the TLM measurement ~2 × 10-4, ~3.1 × 10-4, ~5.5 × 10-4, and ~7 × 10-4 Ω cm2, respectively. The resistivity of the ZnO NWs is measured by using point technique method as ~20 ×106, ~12×106, ~8×106, and ~5×10-2 Ω for Ti/Au contacts to pure and Al, Sn and Mg-doped ZnO nanowires with diameters of 50 and 60nm, respectively.