

Chapter 6

Closure

We have discussed the fundamentals of the new piezotronic effect and some novel sensing applications. The piezotronic effect provides a novel approach for modulating junction properties through mechanical stimuli. It provides a direct measurement of the strain and the applied force with the piezotronic device. Many other sensors have also been reported with much enhanced performance thanks to the exponential dependence of the carrier transport on the barrier height at the interface. The development of piezoelectric semiconducting nanomaterials has a bright future for creating multifunctional electronic devices. However, practical application of this new technology asks for more research efforts to address challenges that remain. First of all, cost needs to be reduced, and the yields and controllability need to be improved for nanomaterial growth and device fabrication. Second, the piezoelectric polarization change can be induced from pressure, thermal strain, absorbed species, etc. The interactions are intertwined, so the selectivity and stability of the sensor need to be investigated. Third, the piezoresistive effect also causes conductivity change in response to the mechanical strain, and both the piezoresistive and piezotronic effects need to be carefully studied in the design and characterization of sensors [38]. In addition, the development of new piezotronic nanomaterials and novel sensors is expected in the future. Finally, the integration of multifunctional sensors with other electronics and nanogenerators will be critical for the realization of self-powered nano-systems.