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Bending strain induced exciton fine-structure splitting and shift in bent ZnO microwires XUEWEN FU, QIANG FU, ZHIMIN LIAO, XINLI ZHU, JUN XU, School of physics, Peking University, Beijing, China, HANCHUN WU, CRANN and School of Physics,Trinity College Dublin, Dublin, Ireland, ZHUHUA ZHANG, WANLIN GUO, Institute of Nano Science, Nanjing University of Aeronautics and Astronautics, Nanjing 210016, P. R. China, Nanjing, China, DAPENG YU, School of physics, Peking University, Beijing, China — Bending Strain causes rich physical phenomena, such turning the mechanical energy into electricity in nanowire nano-generators by Z. L. Wang, significant modification of the emission energy of semiconductor micro/nanowire materials up to 100 meV, and enhancement of the light emission intensity up to 17 times of the LEDs etc.. Here, we investigate for the first time the exciton spectra evolution in bent ZnO microwires along the radial direction via high spatial/energy resolution cathodeluminescence spectroscopy at 5.5 K. Our experiments show that the exciton peak splits into multi fine peaks towards the compressive part while retains one peak in the tensile part and the emission peak displays a continuous blue-shift from tensile to compressive edges. In combination with first-principles calculations, we show that the observed near-band-edge emission splitting in compressive side is due to the valence band splitting by compressive strain and the absence of peak splitting in the tensile part maybe due to the highly localized holes in the A band and the carrier density distribution across the microwire by piezoelectric effect induced electric field. Our studies may pave the way to design nanophotonic and electronic devices using bent ZnO nanowires.

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