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Strong Red Luminescent Twin ZnO Nanorods for Nano-thermometry and Phonon Tunnel Device Application AVANENDRA SINGH, KARTIK SENAPATI, NISER, KARUNAKAR NANDA, IISC, BISWARUP SATPATI, SINP, PRATAP SAHOO, NISER — Two segments of horizontally grown crystalline ZnO nanorods (NRs) connected with an amorphous layer have been successfully synthesized using aqueous growth technique. The amorphous layer between the crystalline ZnO sections is tunable with growth parameters and confirmed by transmission electron microscopy. The confocal photoluminescence (PL) imaging and spectroscopy of twin ZnO NRs at different temperature shows stable and intense red emission with comparably weak UV emission. Red emission from the twin NRs are the consequence of surface defect and structural imperfections of lattice disorder. The disappearance of asymmetry in UV emission after 293K indicates the weak exciton-phonon coupling at higher temperature while the coupling is stronger at lower temperatures. An indirect analysis from phonon bands of PL shows that the amorphous layer acts as a phonon barrier beyond certain thickness. Such crystalline-amorphous-crystalline architecture may be suitable for fundamental studies of the phonon tunneling in nanostructure. We also show that the individual NRs can be used for sensing and mapping of temperature in a wide range of 80-373 K with an accuracy of 0.1K with good sensitivity. These NRs may have suitable application for non-contact nano-thermometry.

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