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Observation of defect-induced Photoresponse and charge carrier transport in single GeSe2 nanobelt devices[1] BABLU MUKHERJEE, ENG SOON TOK, CHORNG HAUR SOW, National University of Singapore — Single crystal GeSe2 nanobelts were grown using chemical vapor deposition techniques. Morphology of the nanostructures was characterized using scanning electron microscopy (SEM), transmission electron microscopy (TEM), X-ray diffractometry (XRD) and Raman spectroscopy. Electronic transport properties, impedance spectroscopy, photoconductive characteristics and temperature-dependent electrical resistivity measurements were carried out on individual GeSe2 nanobelt devices. The photosensitivity of single GeSe2 nanobelt (NB) devices was examined with two different excitation wavelengths of laser beams with photon energies above band gap and at sub-band gap of the NB. A maximum photoconductive gain 10^6 % was achieved at a wavelength of 808 nm. The magnitude of the photocurrent and response time of the individual GeSe2 NB device indicate that the photoresponse could be attributed to the presence of isolated mid band gap defect levels. Temperature dependent photocurrent measurements indicate the rough estimation of the energy levels for the defect states. Localized photostudy shows that the large photoresponse of the device primarily occurs at the metal-NB contact regions.

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