Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Local Photocurrent Mapping of Nanowire Photodetectors with Ohmic and Schottky Contacts YI GU, JOHN P. ROMANKIEWICZ, JESSICA L. LENSCH, TERI W. ODOM, LINCOLN J. LAUHON, Northwestern University — Near-field scanning photocurrent microscopy (NSPM) was used to determine the mechanisms of carrier transport and collection in CdS nanowire photodetectors. NSPM employs an apertured NSOM probe as a local (<100 nm) illumination source to map the local photocurrent as a function of the tip position along the device, i.e., from one metal contact to the other. Striking differences between Schottky and ohmically contacted devices have been observed in maps of the local photocurrent. In the Schottky devices, the photoinduced current is localized to the reverse biased diode, whereas in ohmic devices, the peak photoresponse position shifts continuously with applied bias. Modeling of the photocurrent profiles in ohmically contact devices gives the mobility-lifetime product for electrons and for holes. When independent carrier lifetime measurements are considered, one can extract electron and hole mobilities. As expected for CdS, the electron mobility exceeds the hole mobility, producing the observed shift of the photocurrent peak towards the hole collector. The effects of surface passivation and trap filling on carrier transport have also been explored.

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Date submitted: 07 Dec 2005 Electronic form version 1.4