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Tuning the thermal conductivity of InAs nanowires with carrier density MANDAR DESHMUKH, SAJAL DHARA, HARI S. SOLANKI, ARVIND P. RAVIKUMAR, VIBHOR SINGH, ARNAB BHATTACHARYA, Tata Institute of Fundamental Research, Mumbai, India 400005 — We measure thermal conductivity of four probe suspended InAs nanowires, using 3-omega technique. The InAs wires are 3 micron long and 60 nm in diameter. Measurements are done in the temperature range from 10K to 180K. Our VLS grown n-type InAs nanowires have a measurable density of twin defects, which could give rise to the measured low thermal conductivity. Our four probe devices are in field effect transistor geometry and the carrier density in the nanowire can be tuned by the gate electrode. We observe two regimes – one above 60K, where the thermal conductivity increases with decreasing carrier density and in the second regime, below 60K, the thermal conductivity of nanowire increases with increasing carrier density. We discuss the role of electrons and phonons to understand our results.

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