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Semiconducting nanowire electromechanics in the Coulomb blockade regime HARI SOLANKI, SAJAL DHARA, ARNAB BHATTACHARYA, MANDAR DESHMUKH, Tata Institute, Mumbai, India — We fabricate and study Indium Arsenide (InAs) nanowire electromechanical resonators, in field effect transistor (FET) geometry, which allows us to tune the carrier density and tension in the wire at electromechanical resonance by tuning the dc gate voltage. At temperatures below 5K, quality factor (Q) of these resonators is ∼10000, two orders of magnitude larger than at room temperature, and the dynamic range reduces by an order of magnitude at low temperatures. Further in Coulomb blockade regime (charging energy ∼10 meV), using rectification technique, we have observed the modification in Coulomb diamond structure at the resonance frequency of the wire. Near the electromechanical resonance frequency, Coulomb peaks become broader symmetrically (independent of dc gate voltage and frequency sweep direction) and right at the resonance frequency their intensity is significantly reduced. This indicates a strong coupling between electron transport and mechanical vibration of the nanowire.

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