Supplementary Information for Probing the gate-voltage dependent surface potential of individual InAs nanowires using random telegraph signals

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Capture Activation Energy and Cross Section

The measured electron capture rate $\langle t_H \rangle^{-1}$ is fit to the expression $\langle t_H \rangle^{-1} = nC_{n0}\exp(-\beta E_B)$, where E_B is the capture activation energy, n is the electron density, and C_n is the capture coefficient.[1–4] The latter is often written as a product of a capture cross section σ_∞ and average carrier velocity v, i.e. $C_{n0} = v\sigma_\infty$. The average carrier velocity exceeds the thermal velocity in the regime of

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electron density n of experiments, and the threshold voltage and therefore carrier concentration $n \propto C(V_{GS} - V_T)$ is essentially independent of temperature. Consistent with these two observations, the prefactor nC_{n0} must be taken as temperature independent. The more commonly employed expression $nC_n \propto T^2$ for non-degenerate semiconductors due to $v \propto T^{1/2}$ and $n \propto T^{3/2} \exp((E_F - E_C)/(kT))$ is not appropriate in this case.

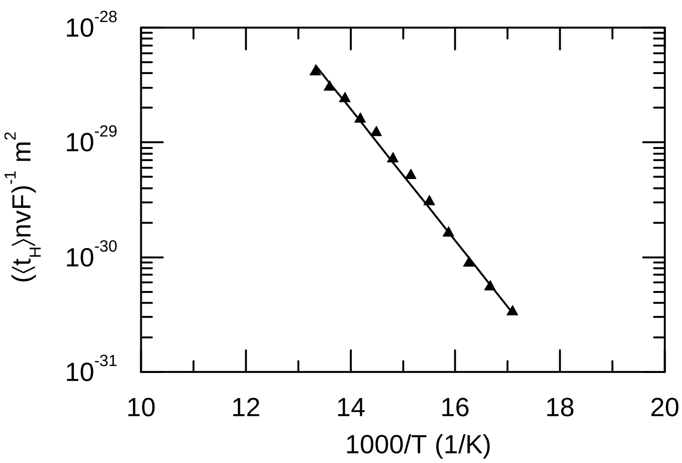

Figure 1: Capture rate data $(\langle t_H \rangle nv_F)^{-1}$ and least squares fit to $\sigma_\infty \exp(-\beta E_B)$

Figure 1 below shows capture rate data and a least squares fit of $(\langle t_H \rangle nv_F)^{-1}$ to $\sigma_\infty \exp(-\beta E_B)$, giving $\sigma_\infty = (2.2 \pm 1.1) \times 10^{-17} \mathrm{cm}^2$ and $E_B = 114 \pm 2$ meV for this particular defect.

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