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Cross-spectrum noise spectroscopy for characterization of deep-levels in nanoscale devices DEEPAK SHARMA, George Mason University, Fairfax, VA 22030, SERGIY KRYLYUK, MSED, National Institute of Standards and Technology, Gaithersburg, MD 20899, ABHISHEK MOTAYED, IREAP, University of Maryland, College Park, MD 20742, QILIANG LI, George Mason University, Fairfax, VA 22030, ALBERT DAVYDOV, MSED, National Institute of Standards and Technology, Gaithersburg, MD 20899 — Applications of traditional methods to study deep-levels, such as deep-level transient spectroscopy, or photo-induced current transient spectroscopy, often become impractical for nanoscale devices. In low frequency noise spectroscopy, the accurate measurements of the noise signal in low-current nanowire devices are extremely challenging because the device noise, which is proportional to the dc current, becomes comparable with the measurement setup noise. To overcome these issues, we have implemented a LFN measurement method based on dual-channel cross-spectrum analysis technique, which reduced the power spectral density (PSD) by three orders of magnitude by reducing the parasitic background 1/f noise, enabling high sensitivity measurements. The method was applied to probe deep-levels in n- and p-type Si nanowires grown by Ni and Au catalysts. Temperature-dependent noise measurement clearly showed Lorentzian peaks due to the generation-recombination (G-R) process via the deep levels introduced by Ni and Au atoms diffused into the Si nanowires during the growth. Important parameters such as trap energies and concentrations of the deep levels, minority carrier life times, hole and electron capture cross sections were calculated for both Ni and Au deep-levels.

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