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Low Frequency noise of nanowire bioFETs NITIN RAJAN, JIN CHEN, DAVID ROUTENBERG, MARK REED, Yale University — In this study we characterize the low frequency noise of top-down fabricated silicon nanowire FETs with exposed channels used as biological sensors. Understanding their low frequency noise behavior is important because signal-to-noise ratio limits the sensitivity of these devices when attempting to detect low analyte concentrations. Using noise spectroscopy we quantitatively demonstrate that a wet orientation dependent etch (ODE) using tetramethylammonium hydroxide yields a lower surface state density and thus better noise performance that common plasma-based etch processes. To thoroughly characterize and accurately model the noise of fabricated silicon nanowires using the wet ODE, we carry out 1/f noise measurements from subthreshold to strong inversion as well as noise measurements at different temperatures. We observe an increase in the noise amplitude at lower temperatures, the increase being more pronounced in the subthreshold region. We also observe a change in the noise profile, indicating a change in the dominant mechanism giving rise to 1/f noise, as the temperature is lowered.

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