Manufacturing Techniques to Improve Silicon Nanowire Repeatability

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Motivation and Objective

• There is a growing demand for sensors such as nanowires, that give rapid medical diagnostic capability at minimal cost.
• Nanowire sensors possess the ability to detect extremely low analyte concentrations in solution in only a few minutes.

Fabrication of Nanowires

• The nanowires were formed by top-down fabrication methods incorporating anisotropic etching of a silicon on oxide (SOI) wafer.
• Multiple fabrication methods were tested utilizing both dry etching and wet chemical etching.

Results

• The nanowires produced utilizing exclusively wet chemical etching techniques increased the functional device yield by nearly 20% when compared to the nanowires produced by a method with a mixture of wet and dry etching techniques.
• The nanowires produced using the wet chemical process (Red) flow had high repeatability across wafers and boats; the functional device yield was consistently above 90%.
• Nanowire devices fabricated using wet and dry etching (Blue) had a functional device yield around 75%.