

Novel in-house fabrication of nano lab-on-chip devices

Abstract

20nm SiNWs transducers have been fabricated by means of simple in-house fabrication method. A low cost, simple top-down approach has been successfully used for the fabrication of very sensitive SiNWs. The fabrication was done without using costly deep reactive ion etching (DRIE) or reactive ion etching (RIE). The process started by patterning wire marked through photoresist and the marked resist was deepened into buffered oxide etch (BOE) for 30mins to etch away the oxide present on the polysilicon surface leaving the photoresist masked portion un etched. Wires of $<3\mu\text{m}$ were obtained with 6 buffered thermal re-etch processes. The wire pattern was trimmed to 20nm using dry etching with constant 5% reduction at 1100°C for 40/5 minutes for Oxidation/BOE respectively. Electrical characterization conducted has shown an increase in sensitivity with the reduction in size while resistance increases at constants 70V supply, the characterized device was surface modified and tested on real sample. The device shows a very good response to the concentration of molecular species in the sample and surface morphology of the device was verified using high powered microscope (HPM) and scanning electron microscope (SEM) for the size reduction. Moreover, the technique can be easily employed for different semiconductor materials without any additional complexity. Hence, a novel and simple approach for fabricating SiNWs as sensors in nanosized with high uniformity is demonstrated.

Keywords

Asem; Buffered thermal re-etch; Characterization; Fabrication; Hpm; Lab on chip; Rie