Field-directed assembly of nanowires: identifying directors, disruptors and indices to maximize device yield

Mahshid Sam [a], Nima Moghimian [a], and Rustom B. Bhiladvala [a*]

Department of Mechanical Engineering and Center for Advanced Materials and Technologies (CAMTEC), University of Victoria, Victoria, BC, Canada
E-mail: rustomb@ uvic.ca

Effect of NW concentration on assembly yield

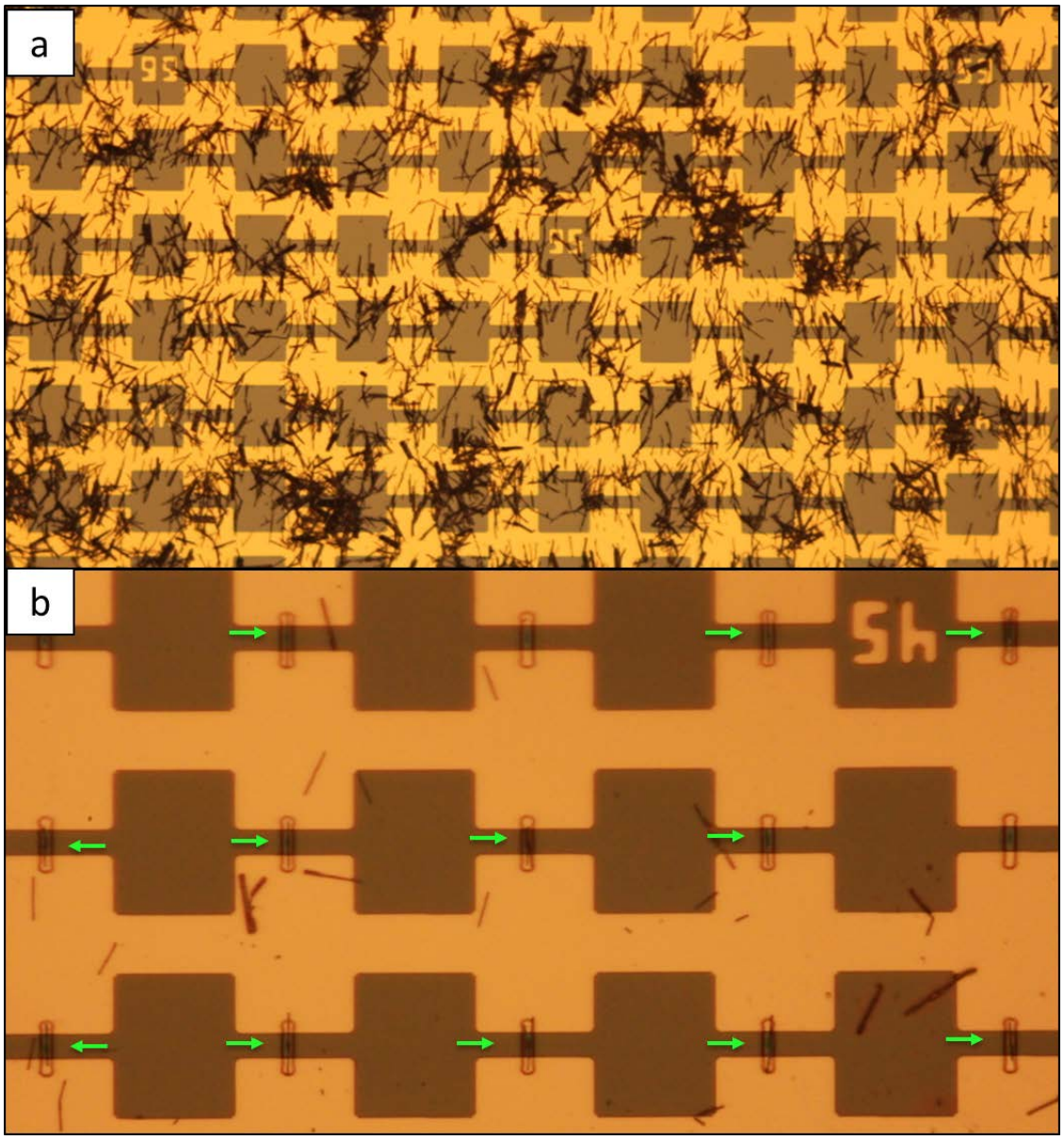

Fig. S1. (a) High concentration of NWs ($3.3x10^8$ NW/mL) results in formation of NW bundles and clumps and prevents positioning single NWs within wells (b) Decreasing the concentration to $19x10^5$ NW/mL, reduces this disruptor. Wells marked with green arrows are filled with single NWs.

Nanowire assembly defects and high yield array of pre-clamped nanowires

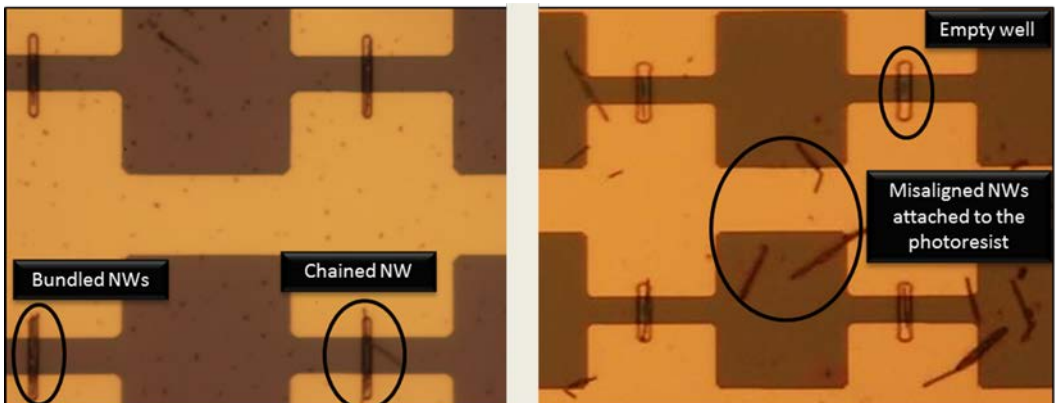

Fig. S2 Optical micrograph of defects during nanowire assembly. Defects such as bundled, chained and empty sites shown can be reduced by lowering nanowire concentration to appropriate working levels. Misaligned (untrapped) nanowires, lie on the photoresist surface, and are removed with the photoresist.

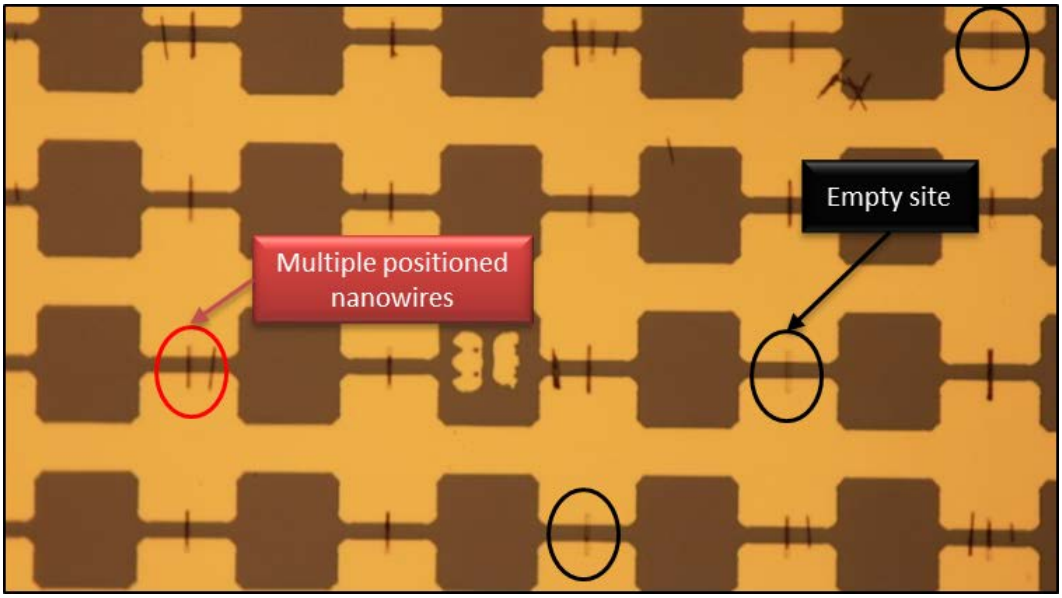

Fig. S3 High pre-clamped yield of nanowires. Where multiple nanowires are positioned in between some electrode pairs, only one nanowire per electrode pair is counted to determine the assembly (pre-clamped) yield.

Nanowire defects and high yield array of post-clamped nanowires

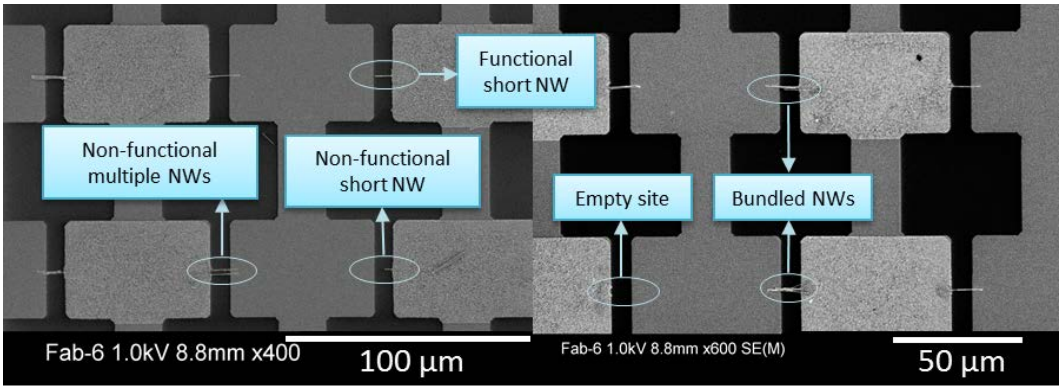

Fig. S4 SEM image of post-clamped defects. Empty sites, bundled or multiple nanowires less than 10 µm apart and short nanowires were not counted as functional nanoresonators. If the free end of a clamped nanowire reaches the edge of the counter electrode below, it is counted as functional device.

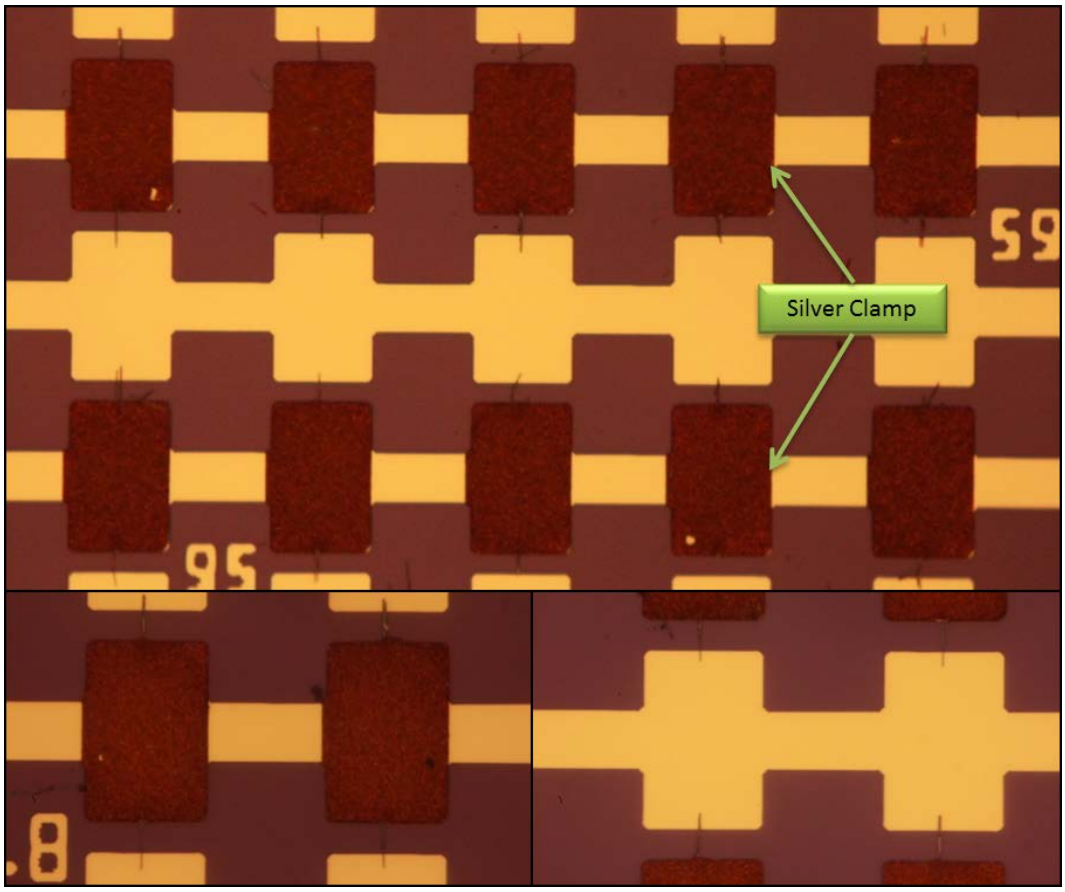

Fig. S5 Clamped nanowires showing high yield after photoresist removal. Dark rectangles mark the rough surface of electrodeposited silver clamps.