

Title	Gold nanowire electrodes in array: Simulation study and experiments
Authors	Wahl, Amélie;Dawson, Karen;MacHale, John;Barry, Seán T.;Quinn, Aidan J.;O'Riordan, Alan
Publication date	2013-04-15
Original Citation	WAHL, A., DAWSON, K., MACHALE, J., BARRY, S., QUINN, A. J. & O'RIORDAN, A. 2013. Gold nanowire electrodes in array: simulation study and experiments. Faraday Discussions, 164, 377-390. DOI10.1039/C3FD00025G
Type of publication	Article (peer-reviewed)
Link to publisher's version	10.1039/C3FD00025G
Rights	© The Royal Society of Chemistry 2013
Download date	2024-04-27 19:54:25
Item downloaded from	https://hdl.handle.net/10468/1642



UCC

University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

Cite this: DOI: 10.1039/c0xx00000x

www.rsc.org/xxxxxx

ARTICLE

Gold Nanowire Electrodes in Array: Simulation Study and Experiments

Amélie Wahl, Karen Dawson, John MacHale, Seán Barry, Aidan J. Quinn and Alan O’Riordan*

Received (in XXX, XXX) Xth XXXXXXXXXX 20XX, Accepted Xth XXXXXXXXXX 20XX

DOI: 10.1039/b000000x

Supplementary Information

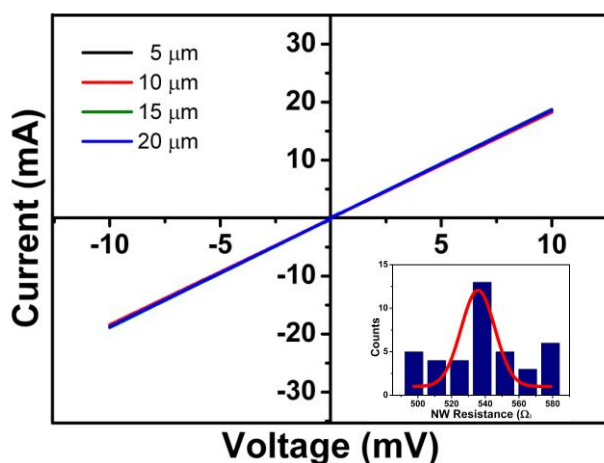


Figure S1: Typical two point I-V characteristics measured for four nanowire arrays with interelectrode separations of 5, 10, 15 and 20 μm, respectively. All nanowire arrays exhibit Ohmic behaviour and low contact resistances regardless of the inter-electrode separation. Inset: histogram showing the distribution of array resistances. Solid red line is a Gaussian fit to the data, average resistance is $539 \pm 26 \Omega$

that the observed electrical characteristics were exclusively generated by the nanowire arrays. Nanowire array devices that exhibit high resistances or open circuit are discarded and not used for electrochemical analysis

Standard two-point I-V measurements in air are undertaken as a quality control check to ensure that all nanowire electrodes are fully functional prior to electroanalysis. A voltage bias of ± 10 mV is selected to confirm Ohmic behaviour. The low voltage range is chosen to avoid undesired electro-migration effects which may damage the nanowires. The electrical behaviour observed at fully fabricated single nanowires is very reproducible as can be seen in Figure 4 inset. All functioning nanowire array devices display linear Ohmic responses confirming good electrical contact to nanowires by the interconnections tracks. Array devices also exhibit low resistance ($539 \pm 29 \Omega$, $n=40$) regardless of their separation, see Figure 4. This low variation ($\sim 5.3\%$) in electrical performance for discrete nanowire arrays is excellent and is consistent with that observed for nanowire dimensions. Control electrical measurements were obtained in the absence of nanowire arrays, yielding very high resistances ($\sim 10 \text{ G}\Omega$) typical of an open circuit. This confirms that the underlying silicon oxide functioned as an effective insulating layer preventing electrical coupling with the silicon beneath and