## **Supplementary information:**



Fig. S1. Scanning electron micrograph of carbon nanotubes after immersion in ethanol and freeze-drying with tert-butanol alcohol.

In fig. S1 a silicon substrate with carbon nanotubes are seen after immersion in ethanol and freeze-drying with tert-butanol alcohol. The carbon nanotubes where vertically aligned before wetting, while been bundled together after drying. The diameter of these carbon nanotubes was around 200 nm and the length was around 5  $\mu$ m.



Fig. S2. Scanning electron micrograph of a pillar array of carbon nanotubes with an inter-pillar distance of  $1.5 \,\mu m$ .

By comparing Fig. S2 with Fig 1c it is seen that the CNTs are more overlapping when the distance between the pillars is  $1.5 \,\mu m$  compared to  $2.0 \,\mu m$ , which explains why gas formation from electrolysis occur at lower voltages for the pillar array with the smallest spacing.