

Figure 1

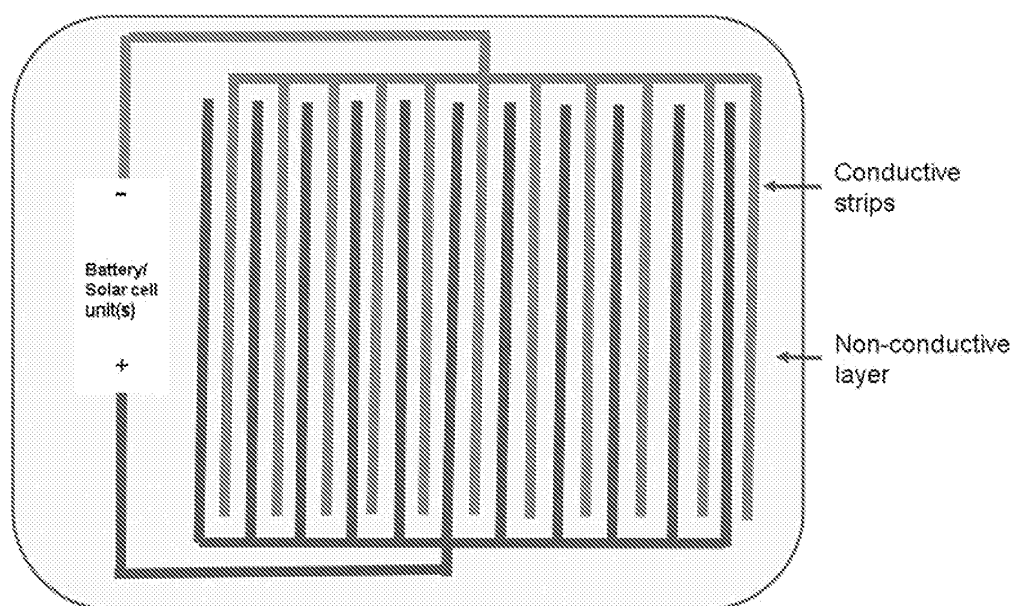


Figure 2

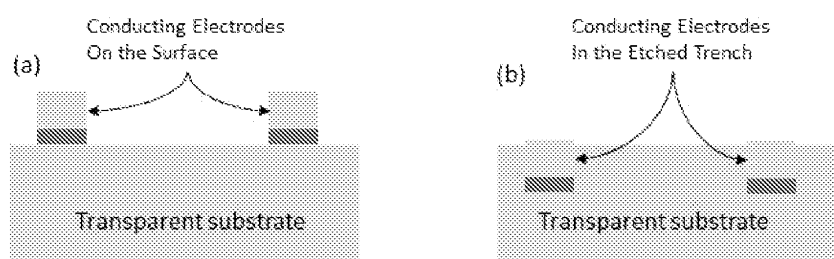


Figure 3

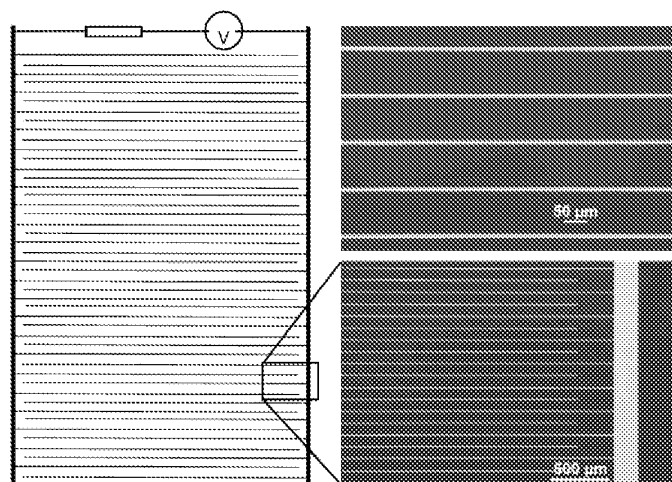


Figure 4

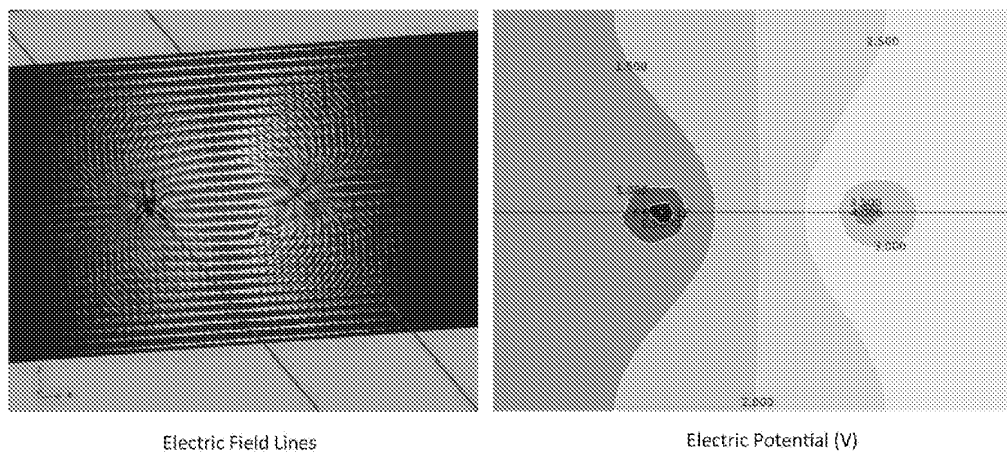


Figure 5

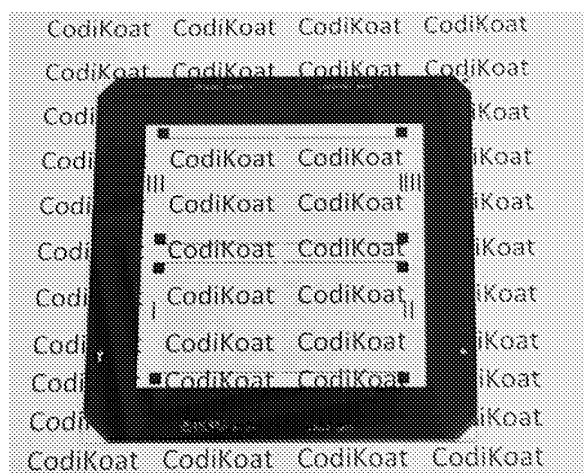


Figure 6

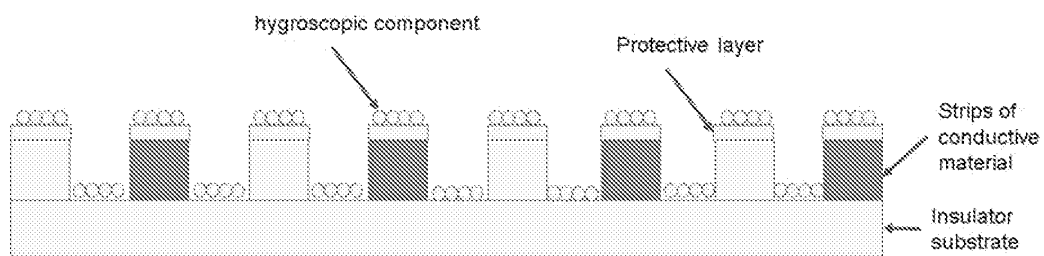


Figure 7

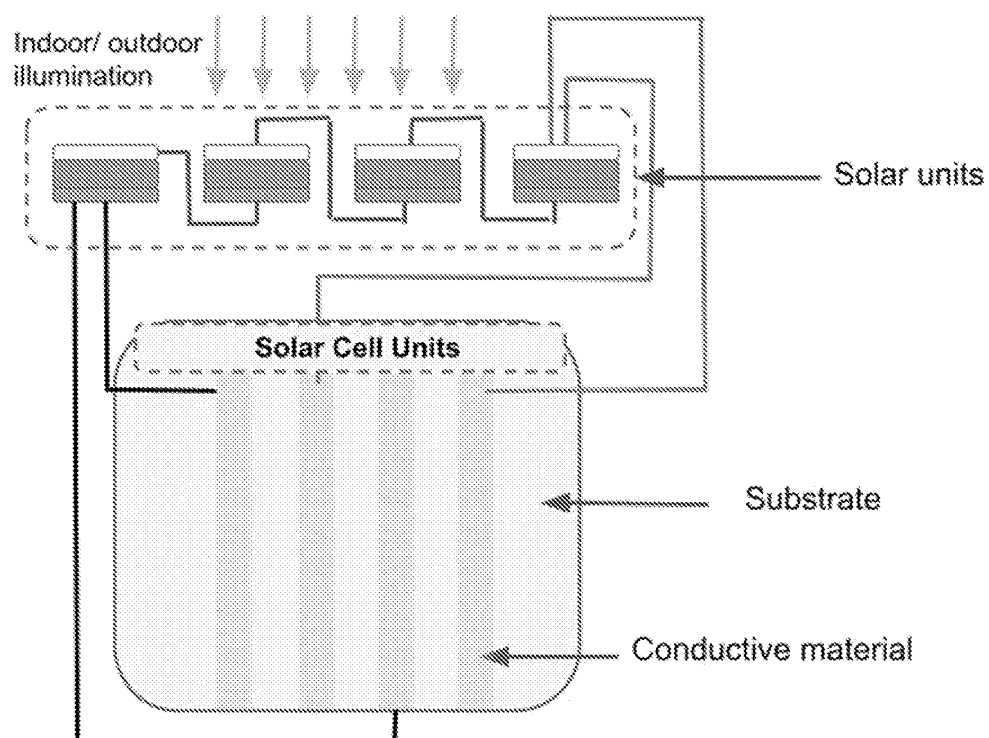


Figure 8

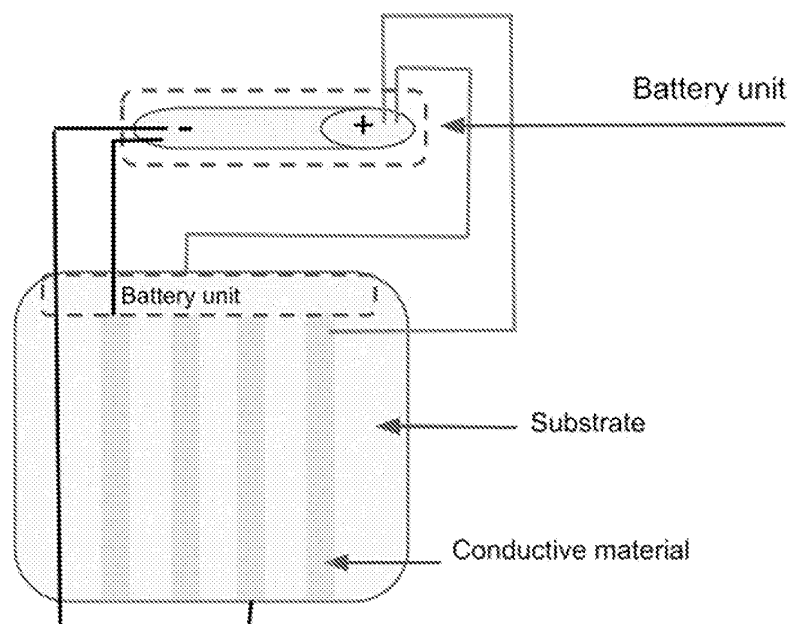


Figure 9

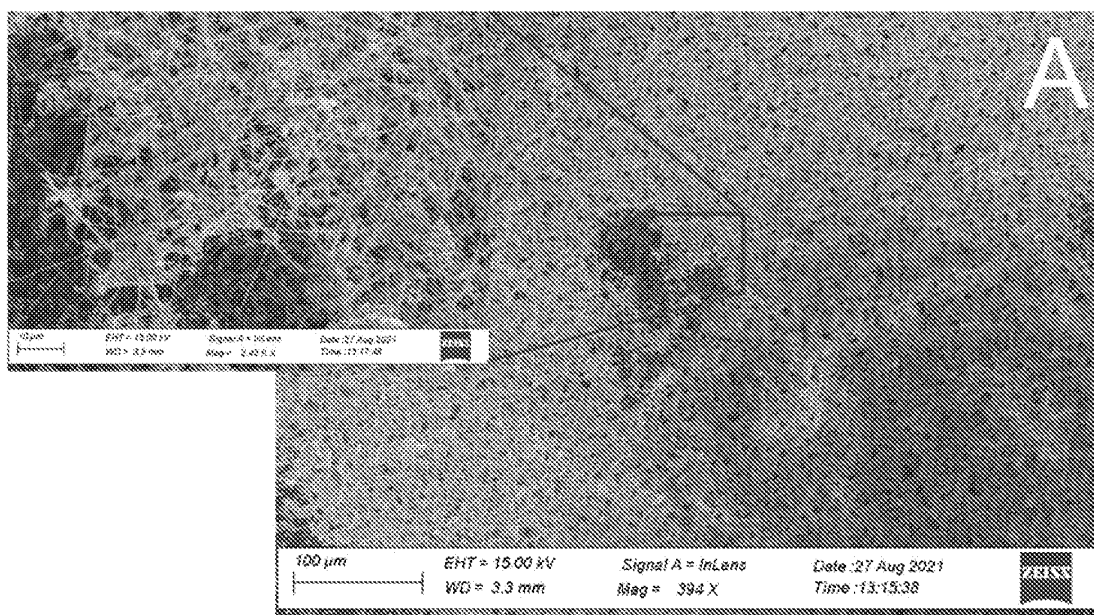


Figure 10a

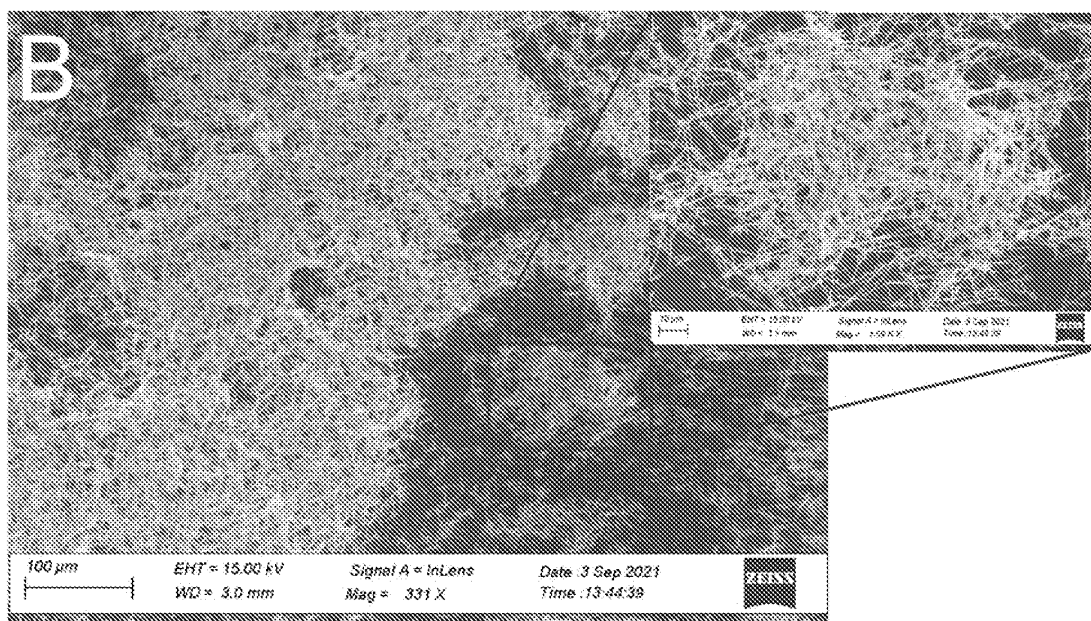


Figure 10b

A

order of magnitude.^[9] Over the years, great progress in creating CNTs wires using wet spinning using super-acids^[10-12] and surfactant-based spin spinning^[14-15] and dry spinning (aligned forest spinning^[16-18] and direct spinning of CNTs aerogel^[19-21]) quality CNTs wires are now commercially available, even electrical conductivity and the specific electrical conductivity of these CNTs wires are still less than copper.^[22-24]

B

onstrated by using a lithographically defined small scale deposited on a silicon chip that CNTs/Cu composite wires have an ampacity 100 times more than copper and have of $9 \times 10^4 \text{ S cm}^{-1}$.^[25] This study shows that CNTs composite wires can have a specific electrical conductivity than copper but achieving such properties for a free and continuous wires still remains a challenge.

C

In this paper we have adopted a new method for making Cu composite wires and we have been successful in producing CNTs/Cu composite wires which have a specific electrical conductivity and ampacity greater than copper. Thus, a microfluidization (MFC) dispersion process has been developed for creating very high concentration (up to 20 wt%) CNTs dispersion using carboxymethyl cellulose sodium (CMC) as a surfactant and water. The first

Figure 11

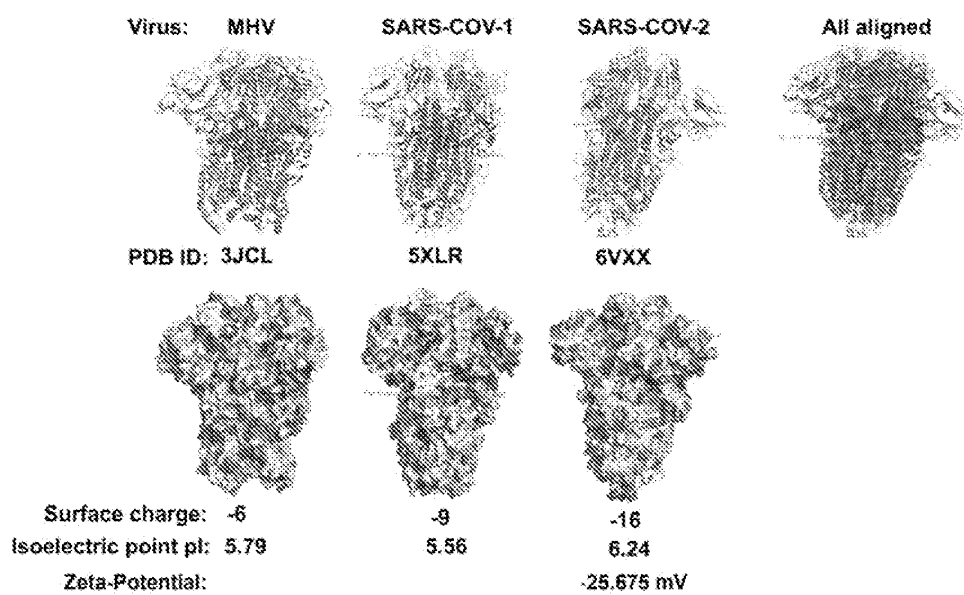


Figure 12

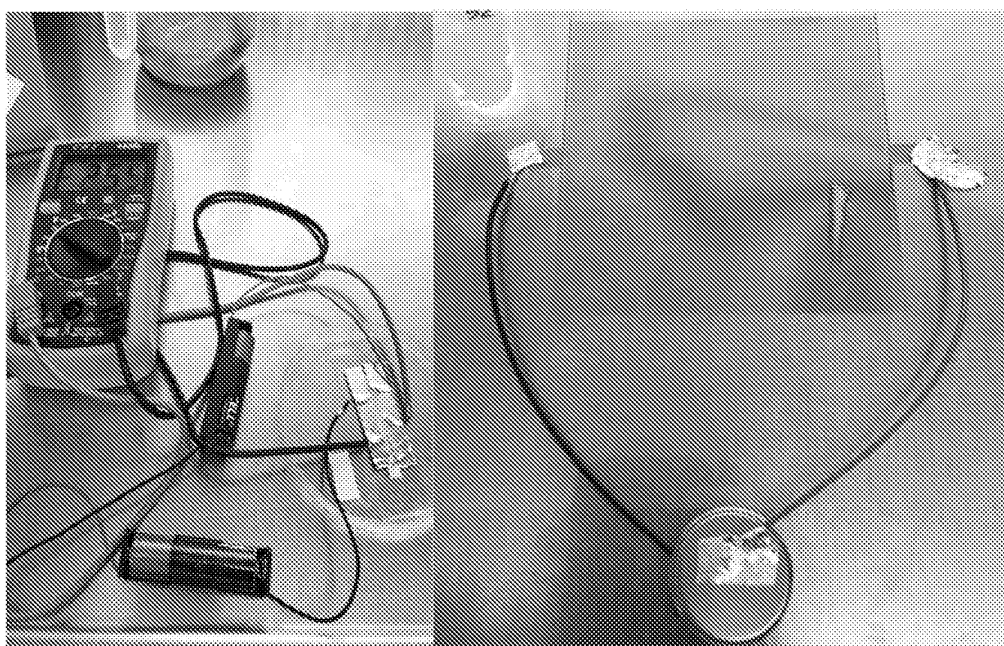


Figure 13

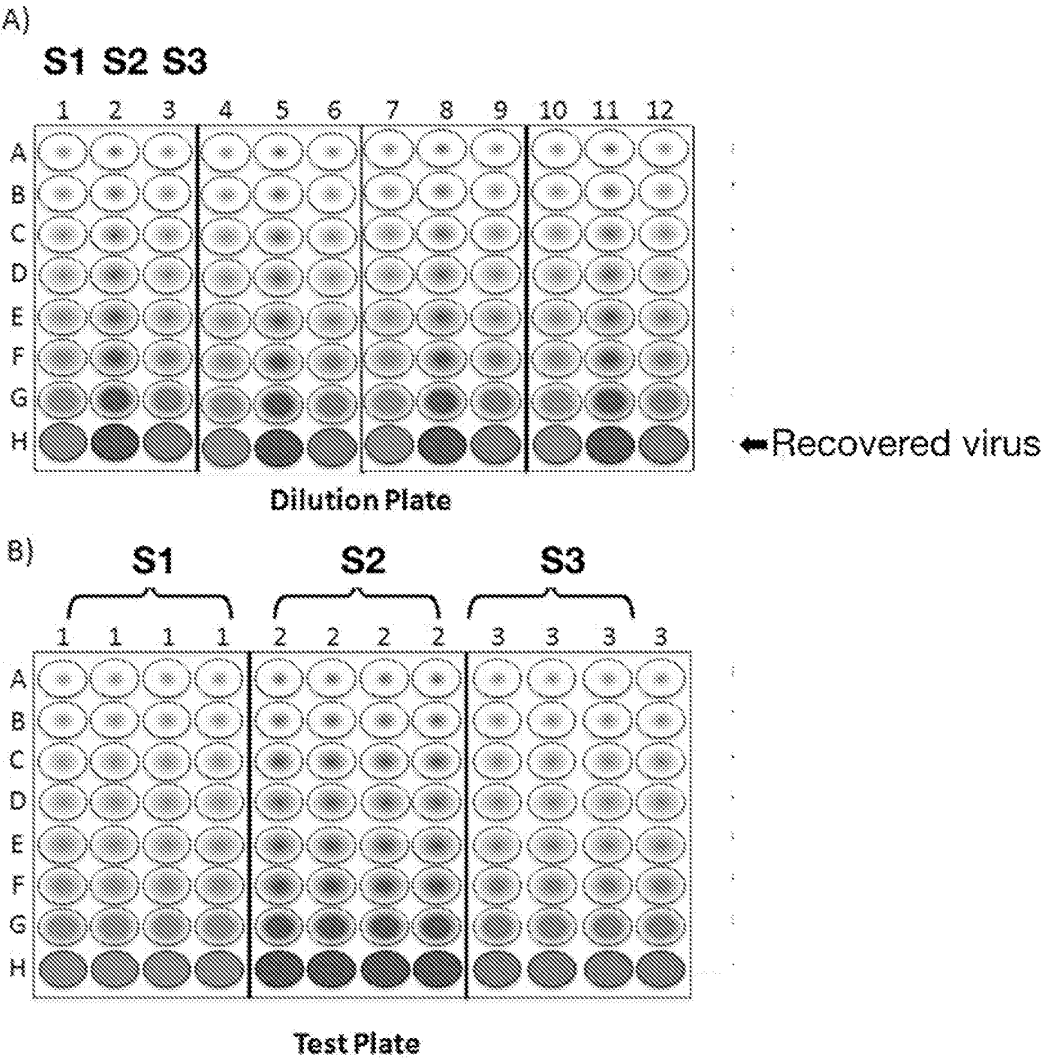


Figure 14

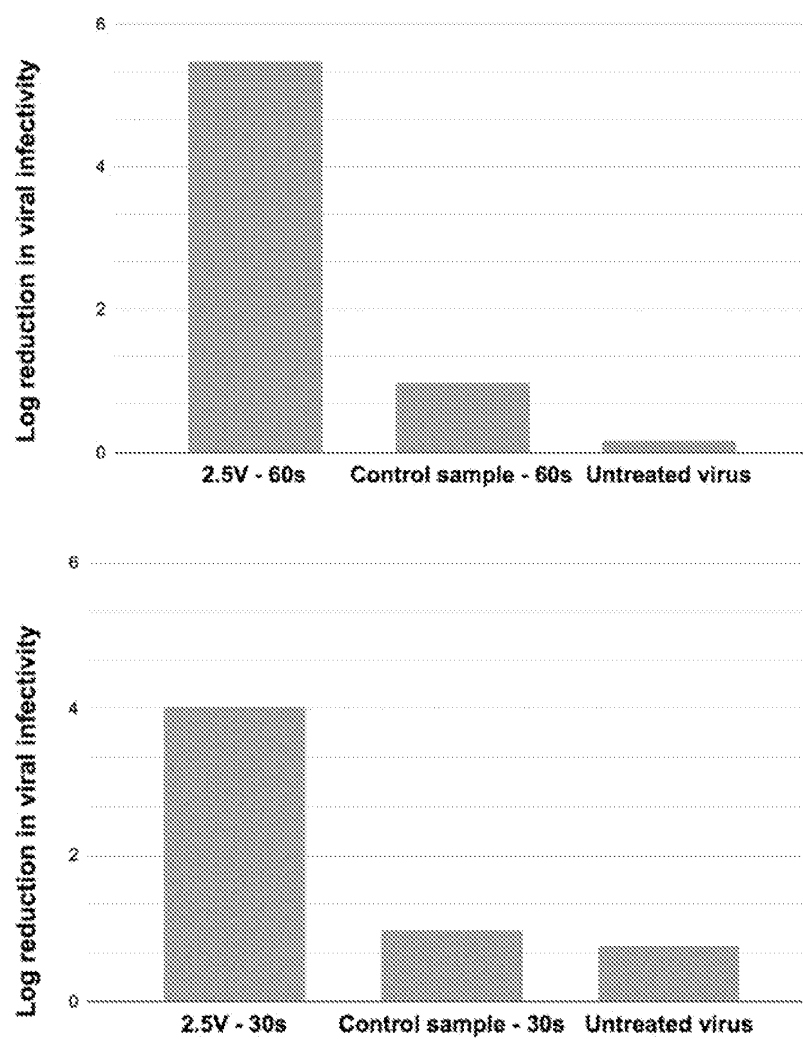


Figure 16

10/15

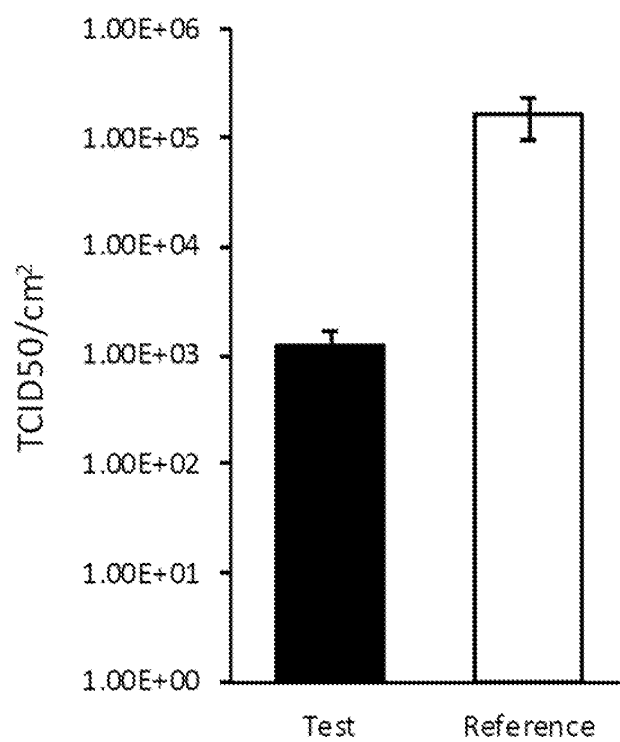


Figure 17

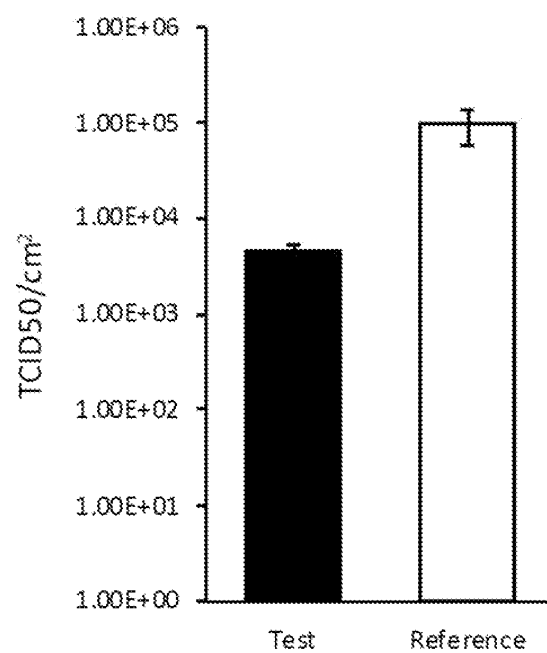


Figure 18

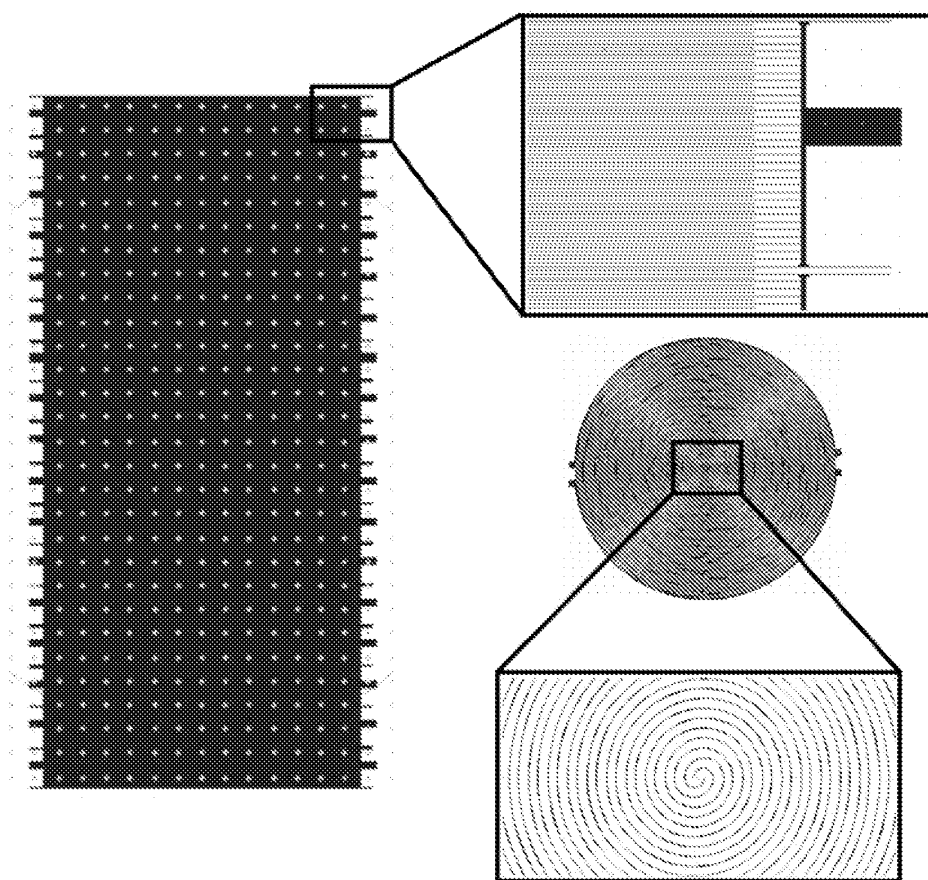


Figure 19

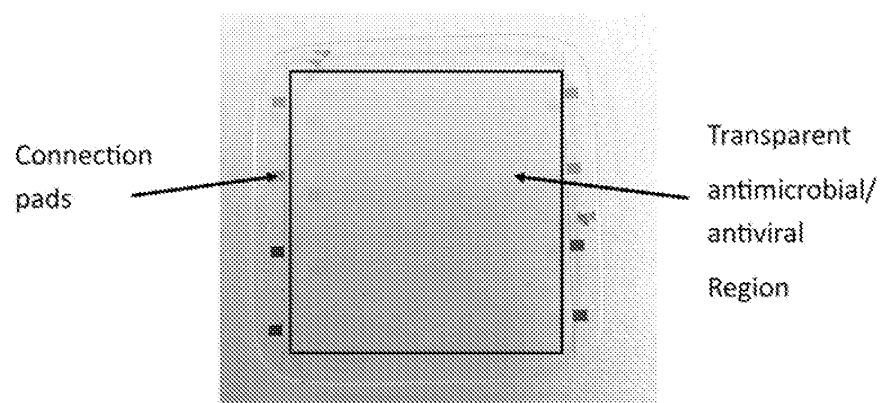


Figure 20A

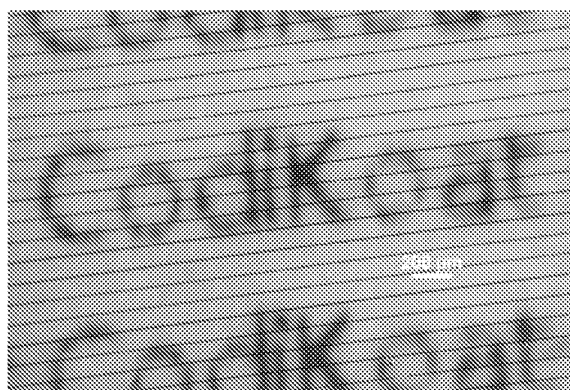


Figure 20B

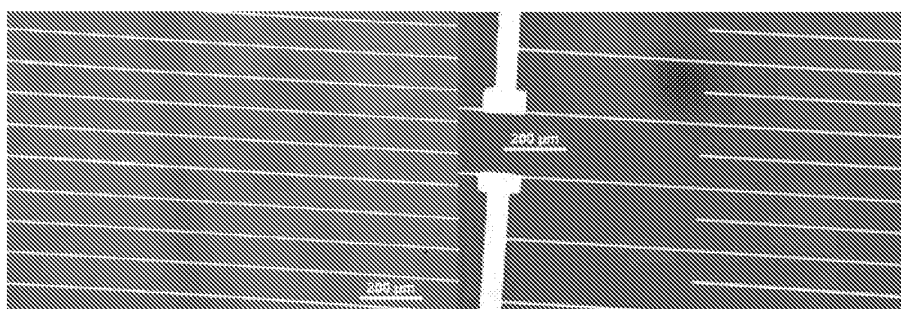


Figure 21

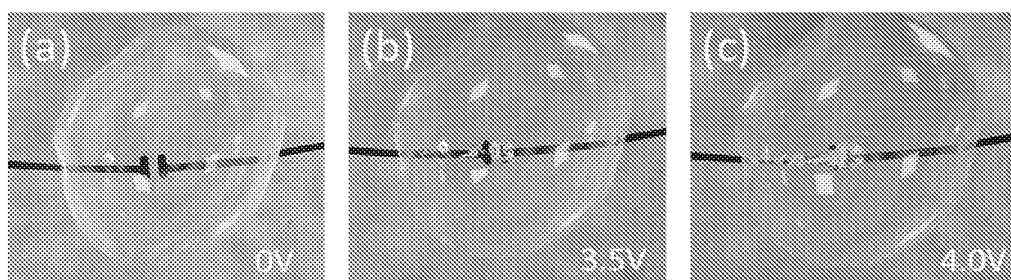


Figure 22

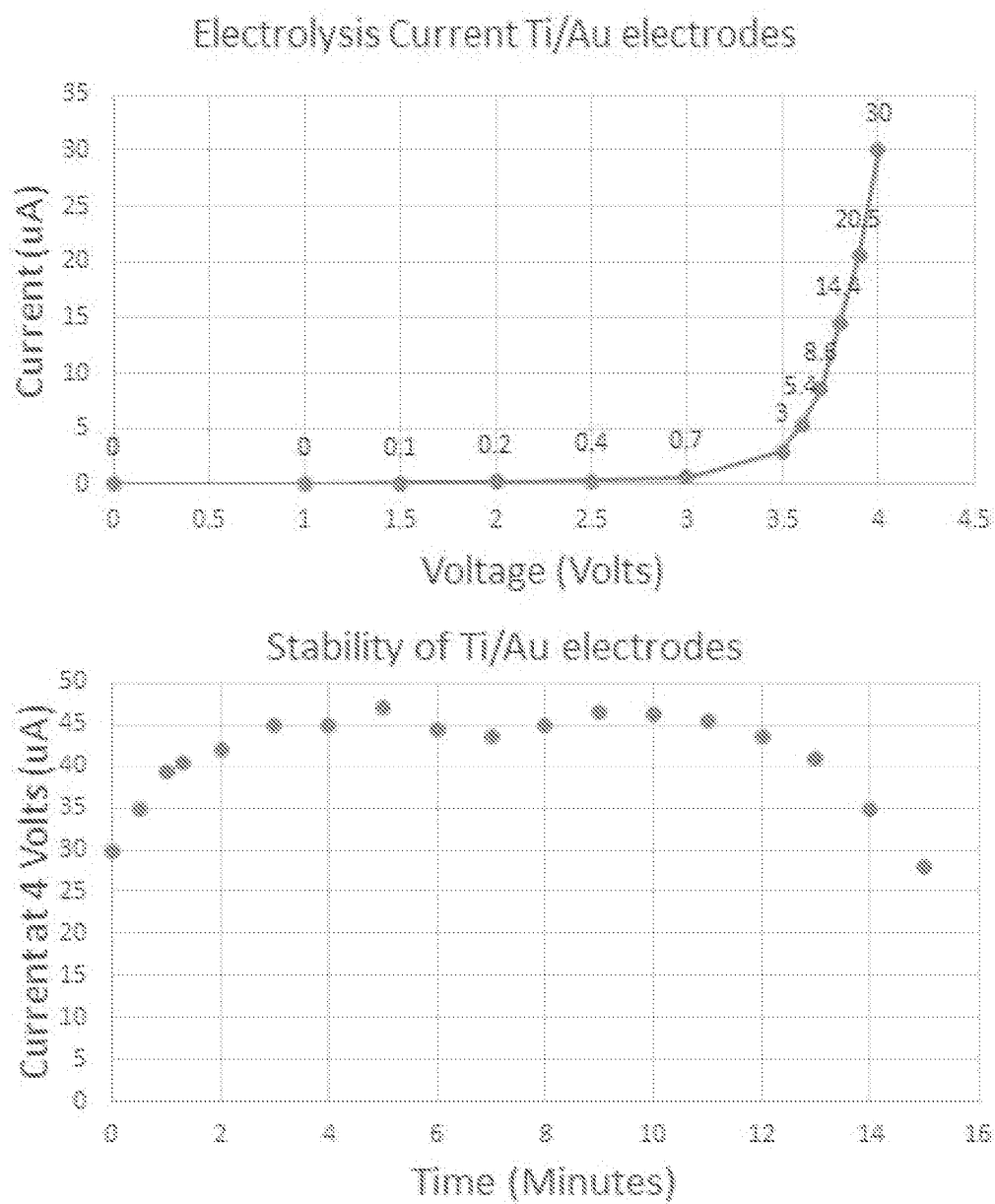


Figure 22 cont.

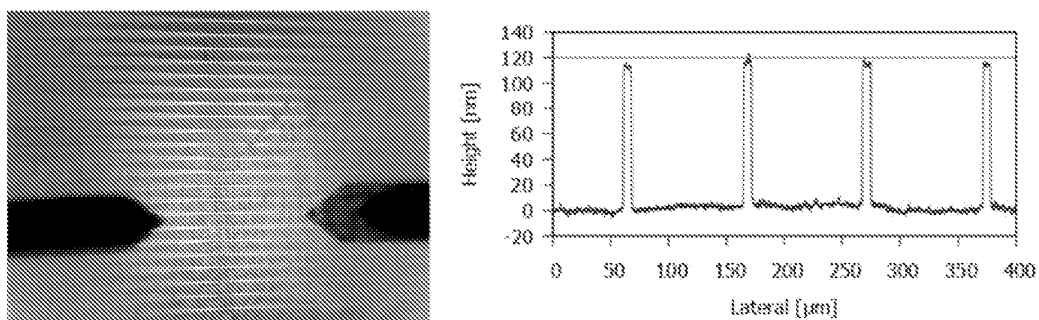


Figure 23

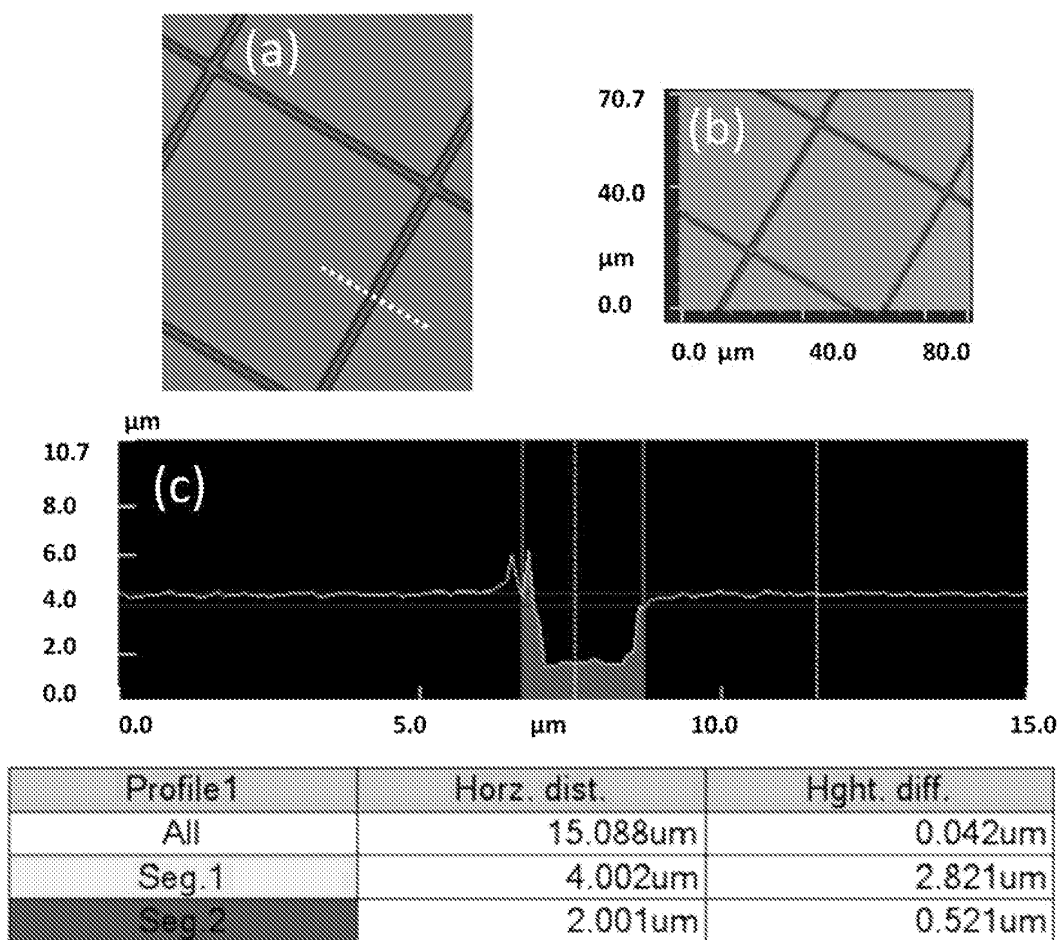


Figure 24A

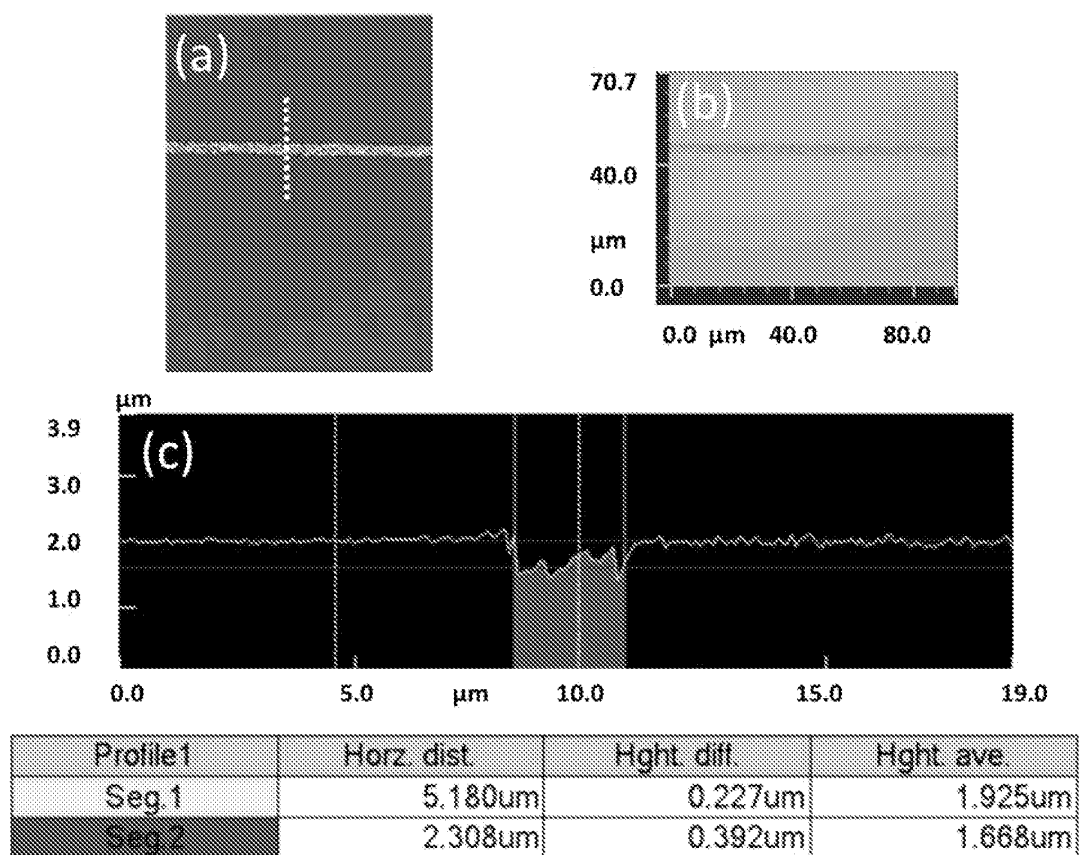


Figure 24B