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ELECTRICITY FROM NANOPARTICLES ON A NANOMEMBRANE

by

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Short paper
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It was reported that electronic current can be produced on a nanofiber membrane during filtration of salt water. This paper argues that nanoparticles on a nanomembrane can also produce electronic current.

Key words: *nanomembrane, bubble-electrospinning, nanofiber, nanoparticle, electronic current*

Introduction

Chen *et al*. [1] first found that a nanofiber membrane during filtration can produce electricity, and explained the interesting phenomenon by the osmosis theory, and concluded that the produced electronic current is due to the change of ionic concentrations through the nanomebrane. Similar phenomenon was also observed on a moisture silk cocoon membrane (SCM) [2]. Both phenomena are of theoretical importance and practical applications in future. In this paper, we conducted another experiment to show that nanoparticles on a nano membrane can produce electronic current as well.

Experiment

Bubbfil^{TM} nanomembrane was bought from Nantong Bubbfil Nanotechnology Company Limited by the bubble electrospinning (bubbfil spinning) [3-5]. An experimental set-up is illustrated in fig. 1, where nanoparticles are produced by a polluted air source. In order to catch nanoparticles easily by the nanomembrane, we immerse the nanomembrane in a $CuSO_4$ liquid for 3 minutes. Though there are many Cu ions on the membrane, there is no current at the initial stage without nanoparticles on its surface. When the polluted air flows towards the surface of the nanomembrane, we can see current in the digital ammeter, fig. 2. The electronic current arises by the second.

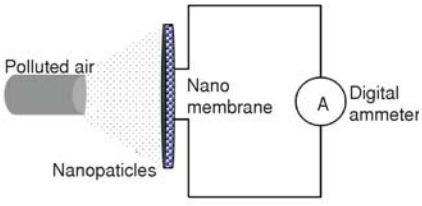

Figure 1. Experimental set-up

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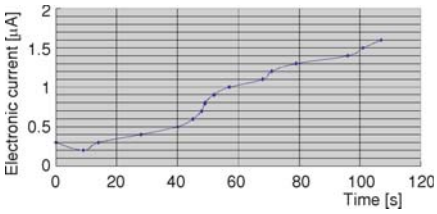

Figure 2. Electronic current *vs.* time

Discussion and conclusion

The current flowing on the surface of the nanomembrane might be due to the surface charge of the nanoparticles, and the $CuSO_4$ liquid enhances the current. A series of experiment is still under way, and a theoretical explanation using nanohydrodynamics and nanothermodynamics is still needed [5]. Our finding is useful for development of energy harvesting devices, which can be found wide applications in various field, especially this technology can be used to produce power from water/air filtration, and it can also be used for filtration sensor, water/air quality monitors, and many other applications.

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