The creation of biocompatible transparent CNT-electrodes

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Carbon nanotubes still show a big perspective in purpose of creation biocompatible composites. Bovine serum albumin (BSA) is very common protein which can be used as biocompatible surfactant for hydrophobic carbon nanotubes.

Also, the creation of transparent conductive electrodes is a very promising field of work. For example, by CNT-BSA composite creation we can solve a problem of biocompatibility of the CNT films and consequently it allows to create a quite new devices.

At this work CNT-BSA water solution was used as a source of refined CNT coated with albumin. The method of solution preparation: a distilled water mixes up with BSA (2mg/1ml) and single-walled carbon nanotubes (1mg/1ml) followed by ultrasonication (duration is about 10 hours).

There are a lot of methods (dip-coating, drop-coating, spin-coating, etc.) of transparent and conductive films creation from carbon nanotubes arrays. But there are some difficulties in achieving of desired results. The cause is that the more density of CNT arrays, the more conductivity, but the less transparency.

At this work suggest a drop-coating method. The method description: on a glass or other optically-transparent and non-conductive substrate drops a solution followed by short-time (5-10 min) lamp heating until the drop dries out. Next, the film (see Fig.) is tested on transparency and conductivity.

To conclude, the work presents the results of the tests. The main problem is that the films are non-uniform. The close to a side, the more transparent film and less percolated (R=1-3 MOhm at 92-95% transparency and R=20-50 kOhm at 85% transparency), and consequently, the more concentrated close to center (R=100-200 kOhm at 92-95% transparency and R=10-15 kOhm at 85% transparency).

Furthermore, the results show us that our methodology could be very promising in purpose of creation brand-new, differently works biocompatible devices (like smart-clothes or pluggable displays, etc.).

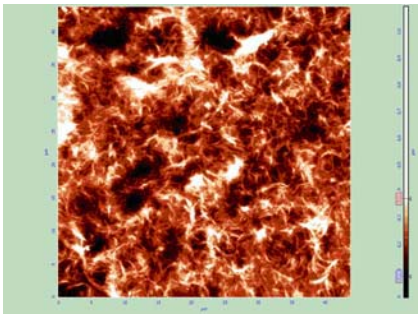

Figure: AFM image of the CNT-BSA film on a glass substrate.