Detection of Conductance Quantization and Designing a Simple Biosensor via Gold Wire

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The nanometer scale researches turned out beyond satisfactory and became part of our life. Some of the difficulties that the researchers faced in nanotechnology are quantized resistance and quantized conductivity. In this study a little fracture is providing in the certain point of microscale wire, observation of the quantized behavior in the conductive nanoscale structures and what changes occurred when DNA molecules added into this environment was aimed. In order to achieve this, a fracture was done onto a microscale gold wire. Thus, discrete conductivity due to sensitive movements of the fracture point was able to measure with proper instruments. We changed our prepared measurement system to a simple and cheap biosensor with the DNA molecules addition. The results from the sensitive measurements indicated that resistance and conductivity are changing in certain steps between fracture and being in touch of fractured points in a gold wire. Different voltage values were calculated according to conductivity formula and these values were coincide with the measured voltage values. When we added DNA molecules to the environment in fractured form of the gold wire, without any mechanical effect, conductivity activity was observed for this condition and also it is seen that when mismatched DNA molecules added, conductivity activity wasn’t observed. By the help of this observation, mismatched DNA has been detected. The quantized change is an important phenomenon and difficult to comprehend matter, became a simple and cheap laboratory experiment with our prepared system. Besides, we identified that DNA addition into the environment as example for a biomolecules provides meaningful changes to the voltage-time graphs and enables our system to use as a biosensor.

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