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Data Article

Conductive atomic force microscopy data from substantia nigra tissue

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ABSTRACT

Ferritin and neuromelanin are present within the dopamine neurons of the *substantia nigra pars compacta* (SNc), and ferritin is also distributed in the intercellular regions of those neurons. It is has been shown that ferritin has electron transport behavior that is the same as electron transport properties of semiconductor quantum dots, and neuromelanin also has similar physical characteristics to the physical characteristics of semiconductor quantum dots. Based on the distribution of ferritin and neuromelanin in the SNc, it has been hypothesized that they could support electron transport in the same manner as disordered or semi-ordered arrays of quantum dots, and that such behavior could be detected from the results of conductive atomic force microscopy (c-AFM) testing. This data article provides the c-AFM measurement data as reported and discussed in "Indication of quantum mechanical electron transport in human substantia nigra tissue from conductive atomic force microscopy analysis." [1].

1. Data

The data includes c-AFM formatted data files that can be read using the Bruker Dimension Nanoscope Analysis software or other compatible software. The actual data files included in this article that

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Specifications Table

Subject area	*Neuroscience*
More specific subject area	*Substantia Nigra Tissue Properties*
Type of data	*Conductive Atomic Force Microscopy Data Files and Photographs*
How data was acquired	*Bruker Dimension, optical microscope*
Data format	*Raw*
Experimental factors	*Substantia nigra tissue samples mounted on foil and de-waxed*
Experimental features	*Standard c-AFM test*
Data source location	*EAG, Inc., Sunnyvale, California.*
Data accessibility	*Data provided with this article and at https://data.mendeley.com/datasets/vwhb5s4yy6/1*
Related research article	"Indication of quantum mechanical electron transport in human substantia nigra tissue from conductive atomic force microscopy analysis." [1]

Value of the Data

- This c-AFM data is provided in raw form, and it can be analyzed to perform additional analysis of the different variables that were measured. The image data is provided to show the tissue samples on which the c-AFM tests were conducted.
- The Bruker Nanoscope Analysis software can be used to generate two- and three-dimensional maps of contact averaged current, peak current, cycle-averaged current, adhesion, deformation and other measured data, histograms and other useful interpretive images. The raw data measurements can also be output into a text file and converted to a suitable spreadsheet software application for additional analysis.
- The I–V curves were generated at various locations, but are limited in nature. Additional testing would need to be performed to obtain I–V data that is more meaningful.

can be read using the Bruker Dimension software or other compatible software are in two sets, and the files have no extension. The first set includes the c-AFM data from the four test samples, and is contained in the following files: TestOne; TestTwo; TestThree; TestFour. The second set includes current-voltage curves that were generated at selected locations, and is contained in the following files: IV-1; IV-2; IV-3; IV-4; IV-5; IV-6; IV-7; IV-8; IV-9; IV-10; IV-11; IV-12; IV-13; IV-14; IV-15; IV-16; IV-17; IV-18; IV-19; IV-20; IV-21; IV-22; IV-23; IV-24 .

The c-AFM test data has also been processed to generate image data files, which are organized in three sets with a number of subsets.

The first set is data from the second c-AFM test sample, and includes 1) Test-two-height.tif, which is an image data set of c-AFM height data; 2) Test-two-contact.tif, which is an image data set of c-AFM contact current data; 3) Test-two-average.tif, which is an image data set of c-AFM average current data; 4) Test-two-peak.jpg, which is an image data set of c-AFM peak current histogram data; 5) Test-two-height.jpg, which is an image data set of c-AFM height data; 6) Test-two-contact.jpg, which is an image data set of c-AFM contact current histogram data; and 7) Test-two-average.jpg, which is an image data set of c-AFM average current histogram data.

The second set is data from the third c-AFM test sample, and includes 1) Test-three-height.tif, which is an image data set of c-AFM height data; 2) Test-three-contact.tif, which is an image data set of c-AFM contact current data; 3) Test-three-contact-iso.tif, which is an isometric image data set of c-AFM contact current data; 4) Test-three-adhesion-iso.tif, which is an isometric image data set of c-AFM adhesion data; 5) Test-three-height.jpg, which is an image data set of c-AFM height data; 6) Test-three-contact.jpg, which is an image data set of c-AFM contact current histogram data; 7) Test-three-average.jpg, which is an image data set of c-AFM average current histogram data; and 8) Test-three-peak.jpg, which is an image data set of c-AFM peak current histogram data.

The third set is data from the fourth c-AFM test sample, and includes 1) Test-four-2D-height.tif, which is an image data set of c-AFM 2D height data; 2) Test-four-contact.tif, which is an image data set of c-AFM contact current data; 3) Test-four-contact-side.tif, which is a side view image data set of c-AFM contact current data; 4) Test-four-height.jpg, which is an image data set of c-AFM height data; 5) Test-four-contact.jpg, which is an image data set of c-AFM contact current histogram data; 6) Test-four-average.jpg, which is an image data set of c-AFM average current histogram data; and 7) Test-four-peak.jpg, which is an image data set of c-AFM peak current histogram data.

The data also includes photographic image data in files: 1) Picture 1 - tissue on glass. Jpg; 2) Picture 2 – tissue on foil. jpg; 3) Picture 3 – Test Two image data.jpg; and 4) Picture 4 – Test Four image data.jpg. The names of these files are descriptive of the contents.

The data provided in this article includes 512 × 512 arrays of data measured from substantia nigra tissue using a Bruker Dimension c-AFM system. The data includes:

1)contact averaged current measured during the period when the c-AFM probe was in contact with the surface at one of the 512 × 512 locations
2) peak current measured during the period when the c-AFM probe was in contact with the surface at one of the 512 × 512 locations
3) cycle averaged current measured during the entire period when the c-AFM probe was being moved towards and away from contact with the surface at one of the 512 × 512 locations
4) adhesion measured during the period when the c-AFM probe was in contact with the surface at one of the 512 × 512 locations
5) deformation measured during the period when the c-AFM probe was in contact with the surface at one of the 512 × 512 locations
6) relative height measured during the period when the c-AFM probe was in contact with the surface at one of the 512 × 512 locations
7) Young's modulus measured during the period when the c-AFM probe was in contact with the surface at one of the 512 × 512 locations
8) peak force error measured during the period when the c-AFM probe was in contact with the surface at one of the 512 × 512 locations.

The Bruker Nanoscope Analysis software can be used to provide graphics for analyzing the data, such as maps of topographical heights, currents, adhesion and other data, histograms of the entire data set or user-selected regions within the data sets, measurement value diagrams along user-selected lines in the data and other useful graphics.

1.1. Experimental design, materials and methods

The Bruker Dimension test equipment c-AFM test data was obtained at EAG Labs, Inc. in Sunnyvale CA, in accordance with standard c-AFM test procedures, to obtain the standard c-AFM data set for four tests on two test specimens. The first test specimen was a nominal 5 μm thick substantia nigra tissue sample mounted on foil, and subjected to two 5-min xylene soaks to remove wax. The second test specimen was a nominal 5 μm thick substantia nigra tissue sample mounted on foil, and subjected to two 30-min xylene soaks to remove wax, with successive ethanol and water soaks to rehydrate the tissue. One test was performed on a 76 × 76 μm area of the first test specimen, and that is referred to as Test One. Three tests were performed on the second test specimen, and are referred to as Test Two (performed on a 76 × 76 μm area), Test Three (performed on a 2 × 2 μm area location of the Test Two area having high contact current), and Test Four (performed on a 76 × 76 μm area).

Acknowledgements

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Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data associated with this article can be found in the online version at Rourk, Christopher (2019), "Data for: Indication of quantum mechanical electron transport in human substantia nigra tissue from conductive atomic force microscopy analysis ", Mendeley Data, v1 https://doi.org/10.17632/vwhb5s4yy6.1.

The CFM data files can be read using the Bruker Nanoscope Analysis software, which is available on request from www.bruker.com, and also at: ftp://anonymous@sboftp.bruker-nano.com/outgoing/GPTech/Software/NanoScope_Analysis_x86_v190r1sr2.exe.

The files include:

TestOne – c-AFM data file for Test One as discussed in (Rourk, 2019).

TestTwo – c-AFM data file for Test Two as discussed in (Rourk, 2019).

TestThree – c-AFM data file for Test Three as discussed in (Rourk, 2019).

TestFour – c-AFM data file for Test Four as discussed in (Rourk, 2019).

IV-1 through IV-24 – current/voltage curves at various locations for sample tested in Test Two through Test Four in (Rourk, 2019).

Picture 1 – photographic image of substantia nigra tissue on glass

Picture 2 – photographic image of substantia nigra tissue on foil for Tests Two and Three.

Picture 3 – photographic image of substantia nigra tissue on foil for Test Four.

Test_two-xxx – image data source files for Figure 1 images discussed in (Rourk, 2019).

Test_three-xxx – image data source files for Figure 2 images discussed in (Rourk, 2019).

Test_four-xxx – image data source files for Figure 3 images discussed in (Rourk, 2019).

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dib.2019.103986.

Reference

[1] C. Rourk, Indication of quantum mechanical electron transport in human substantia nigra tissue from conductive atomic force microscopy analysis, Biosystems 179 (2019 Feb 28) 30–38, https://doi.org/10.1016/j.biosystems.2019.02.003.