

# Hall D Wire Characterization

## Samples S2-1 & S2-2

1. **Sample preparation:** ultrasonic cleaning in DI water for 45 minutes.
2. **Sample installation:** for SEM inspection wires were installed on a sample holder (diameter=36 mm) on 2 stripes of conductive carbon tape, 2 fragment of each sample per stripe (nomenclature: S3-1a, S3-1b and S3-2a, S3-2b).

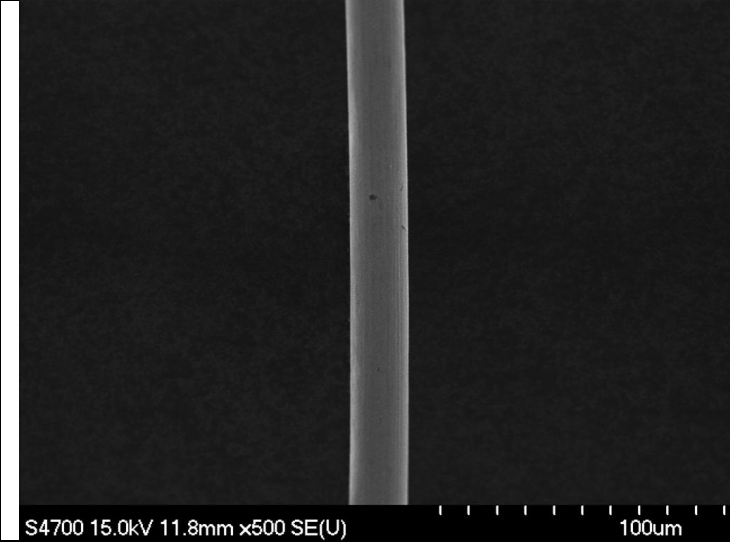
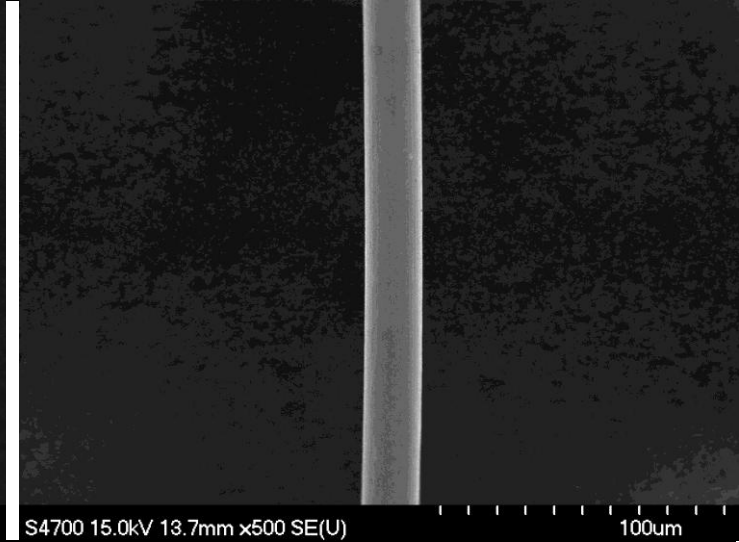
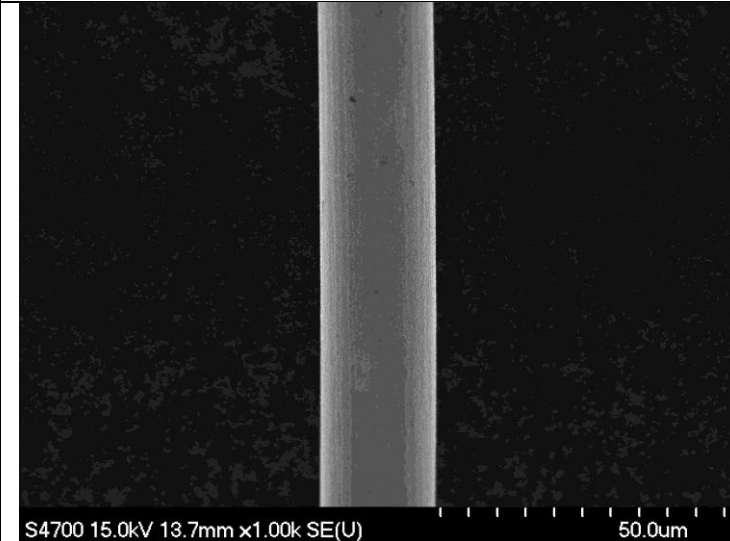
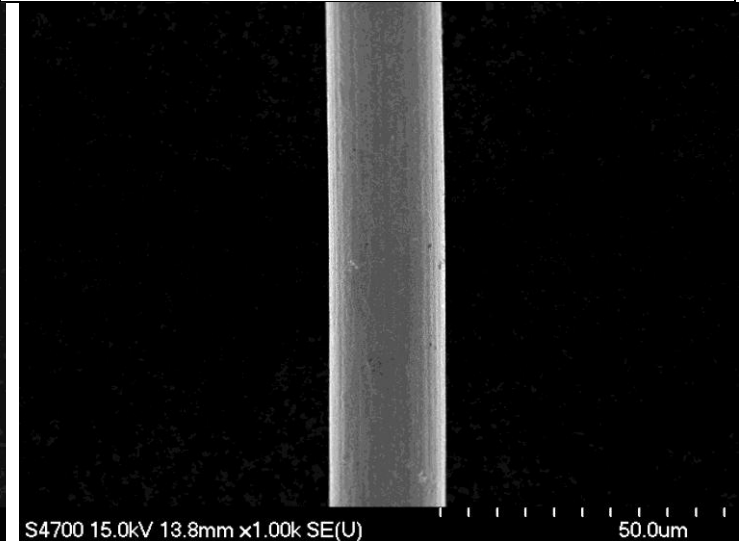


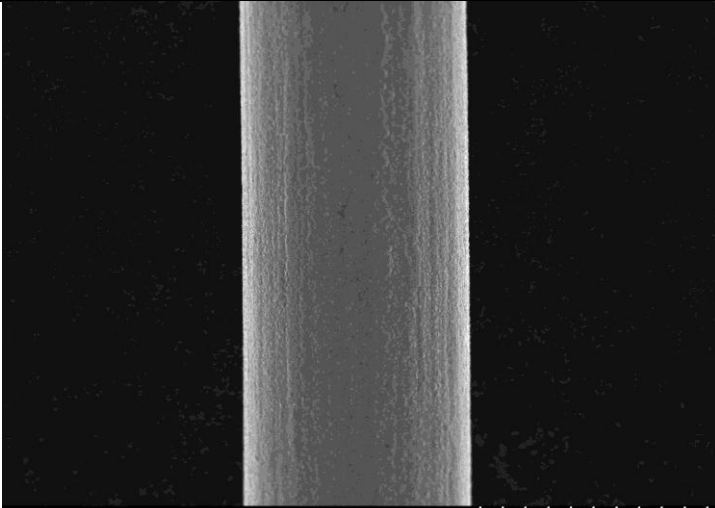
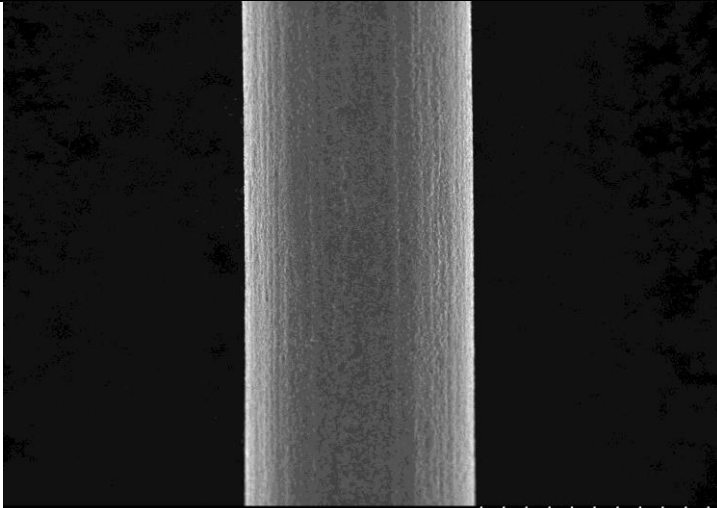
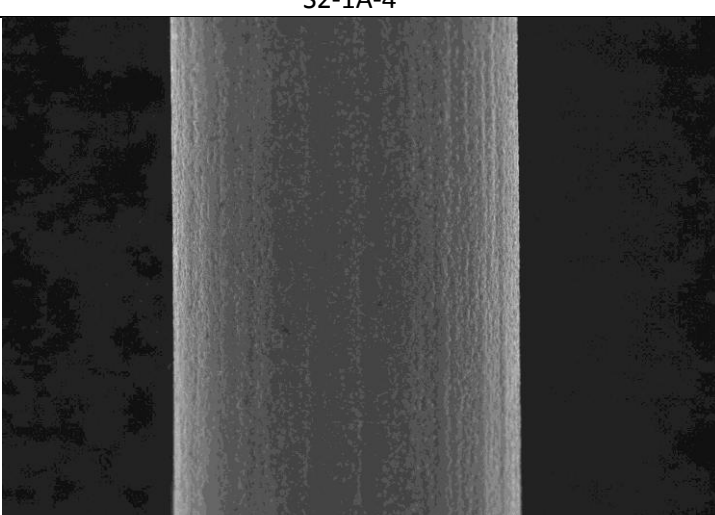
Pic1. Typical sample installation.

3. **Wire inspection:**
  - a) Each wire fragment was examined along its length (beginning at approximately 5mm from the sample holder edge and ending ~5mm before the opposite edge) at magnification of ~1Kx, at fast scan rate.
  - b) Images at designated magnifications were taken randomly along the sample length;
  - c) Images for the ovality measurements were taken at 4000x magnification in three points of each wire fragment: in the middle (approximately) and close to both ends;
  - d) Measurements of wire diameter, as visible on the images, were done using the Quartz PCI Image Management System, 3 measurements per image;
  - e) Additional images at various magnifications were taken at the points of interest (variations in sample topography, contaminated areas, etc.)
  - f) EDS analysis was performed on the most typical points of interest.

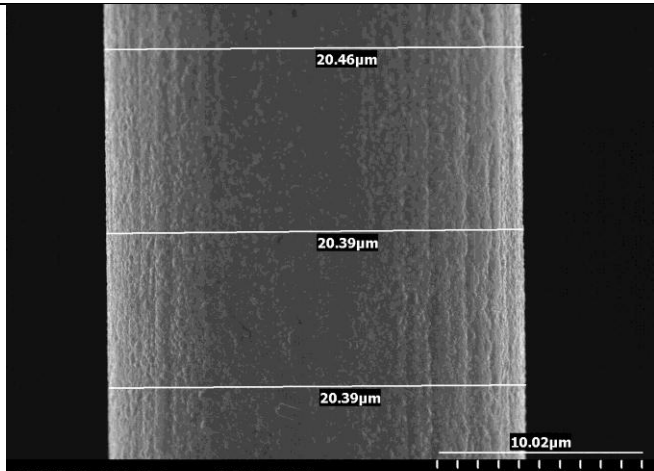
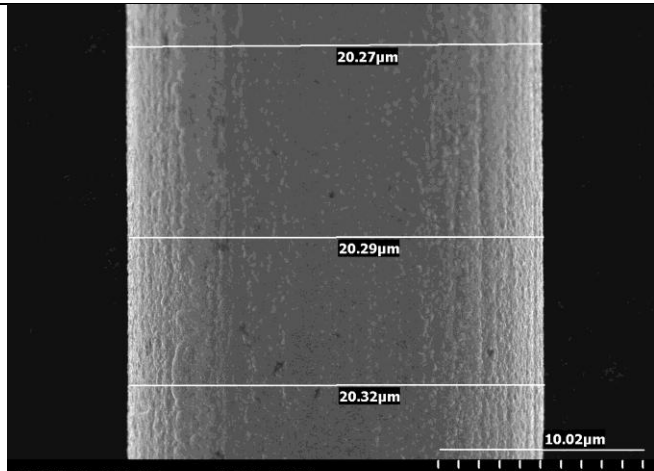
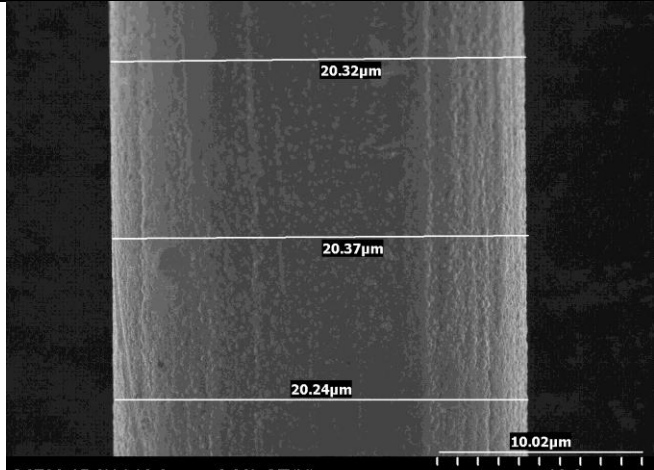
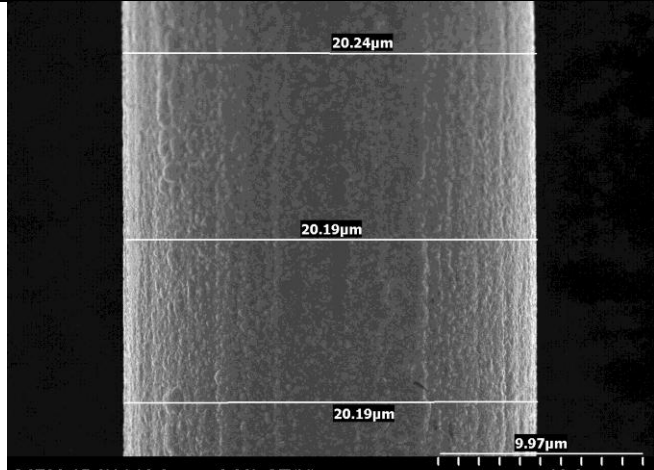
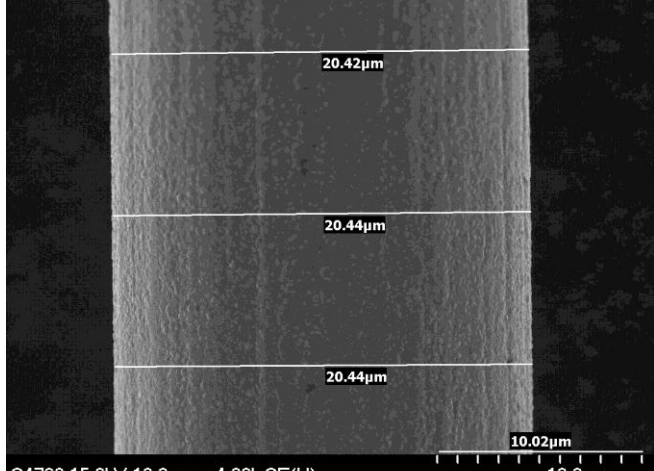
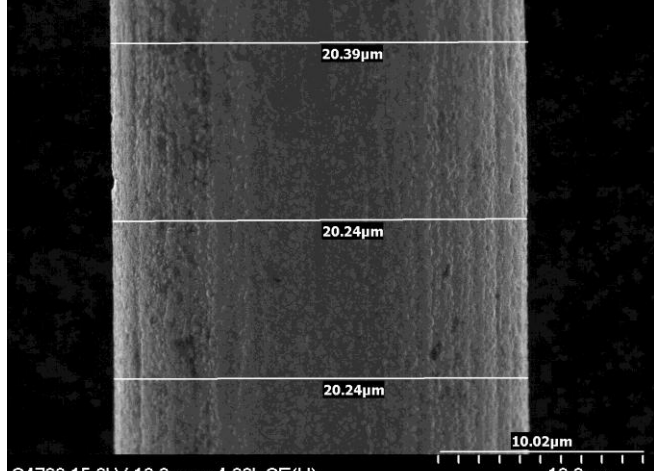
# Sample S2-1 A, B

## I. Images at designated magnifications

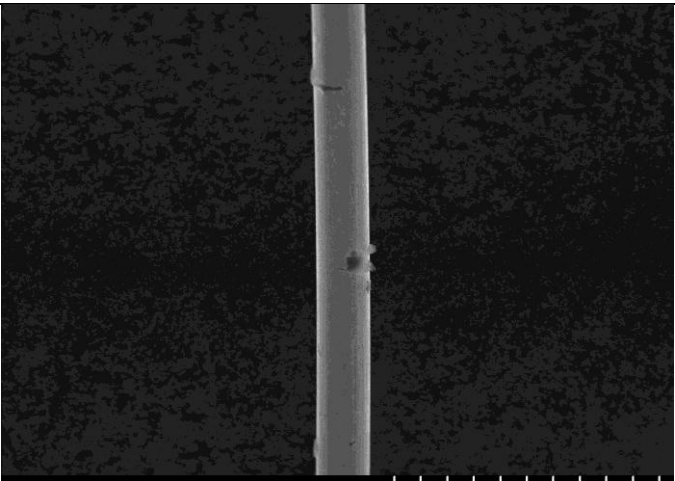
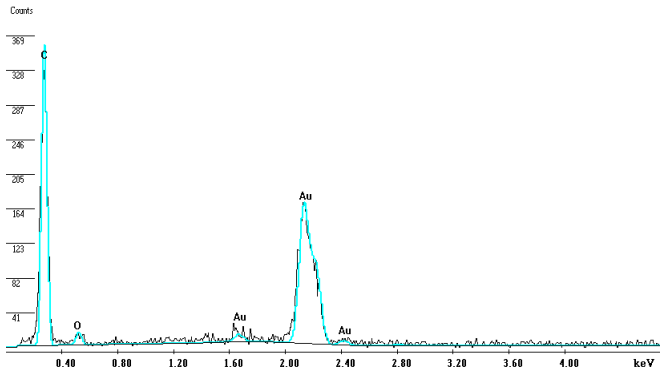
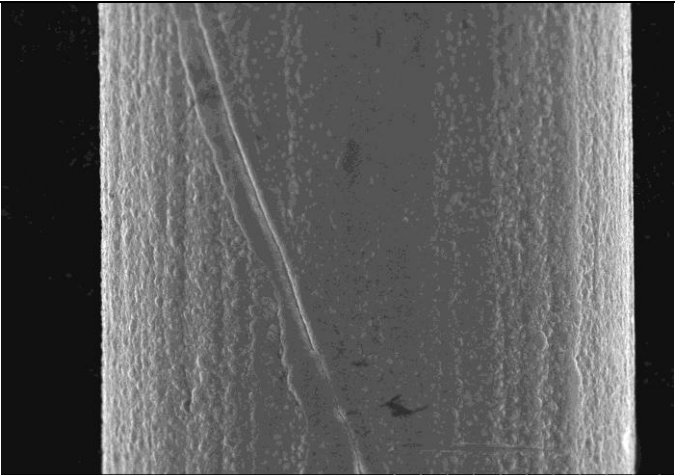
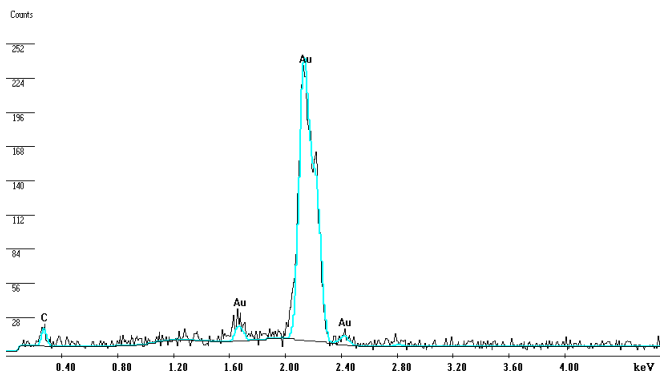
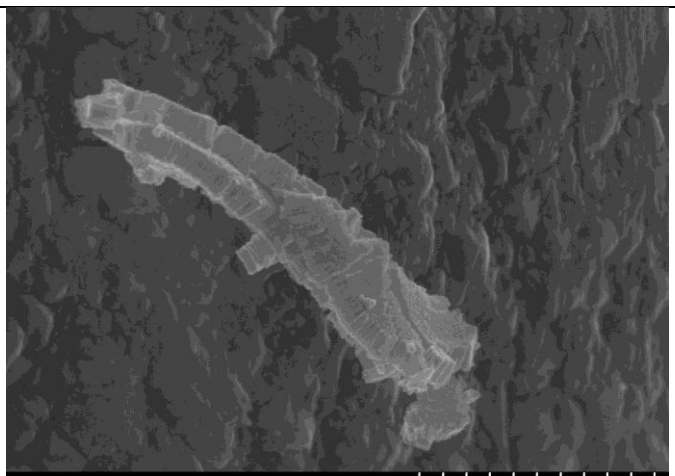
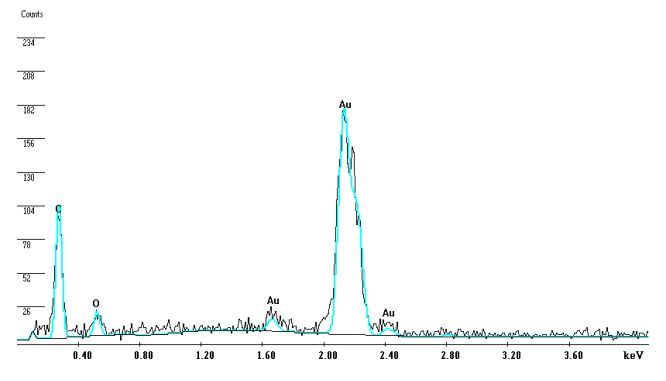
S2-1A-1	S2-1B-1
	
Magnification: 500x	Magnification: 500x
S2-1A-2	S2-1B-2
	
Magnification: 1000x	Magnification: 1000x

S2-1A-3	S2-1B-3
 <p data-bbox="99 779 810 814">S4700 15.0kV 13.7mm x2.00k SE(U) 20.0um</p>	 <p data-bbox="829 779 1541 814">S4700 15.0kV 13.7mm x2.00k SE(U) 20.0um</p>
Magnification: 2000x	Magnification: 2000x
S2-1A-4	S2-1B-4
 <p data-bbox="99 1493 810 1535">S4700 15.0kV 13.8mm x3.00k SE(U) 10.0um</p>	<p data-bbox="938 1003 1414 1037">Sorry, image was not saved by accident.</p>
Magnification: 3000x	Magnification: 3000x

## II. Ovality Measurements

<p>S2-1A-1o</p>  <p>20.46µm 20.39µm 20.39µm 10.02µm S4700 15.0kV 11.8mm x4.00k SE(U) 10.0um</p>	<p>S2-1B-1o</p>  <p>20.27µm 20.29µm 20.32µm 10.02µm S4700 15.0kV 13.7mm x4.00k SE(U) 10.0um</p>
<p>Magnification: 4000x</p>	<p>Magnification: 4000x</p>
<p>S2-1A-2o</p>  <p>20.32µm 20.37µm 20.24µm 10.02µm S4700 15.0kV 13.8mm x4.00k SE(U) 10.0um</p>	<p>S2-1B-2o</p>  <p>20.24µm 20.19µm 20.19µm 9.97µm S4700 15.0kV 13.8mm x4.00k SE(U) 10.0um</p>
<p>Magnification: 4000x</p>	<p>Magnification: 4000x</p>
<p>S2-1A-3o</p>  <p>20.42µm 20.44µm 20.44µm 10.02µm S4700 15.0kV 13.9mm x4.00k SE(U) 10.0um</p>	<p>S2-1B-3o</p>  <p>20.39µm 20.24µm 20.24µm 10.02µm S4700 15.0kV 13.8mm x4.00k SE(U) 10.0um</p>
<p>Magnification: 4000x</p>	<p>Magnification: 4000x</p>

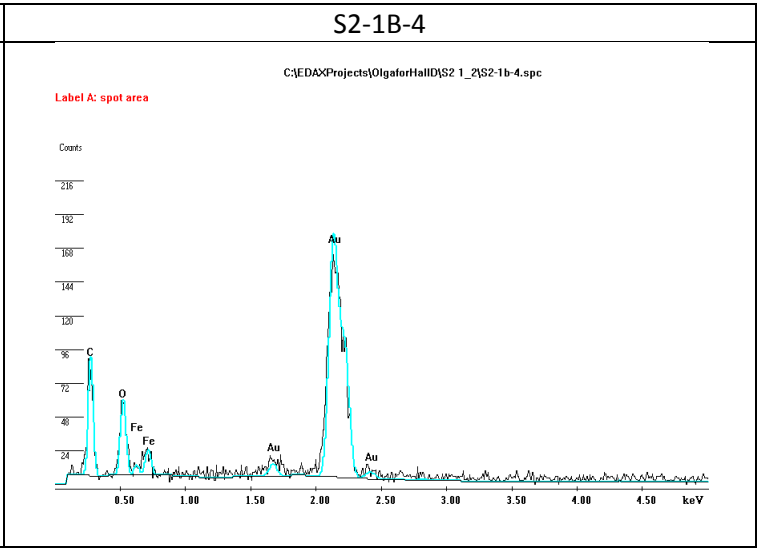
## II. Points of Interest

<p style="text-align: center;"><b>S2-1A-3</b></p>  <p style="text-align: center;">Magnification: 500x</p>	<p style="text-align: center;"><b>S2-1A-3 S1</b></p> <p style="text-align: center;">C:\EDAXProjects\OlgaforHallID\S2_1_2\S2-1a-3.spc</p>  <p style="text-align: center;">EDS Analysis. Environmental contamination</p>
<p style="text-align: center;"><b>S2-1A-5 Scratch</b></p>  <p style="text-align: center;">Magnification: 5000x</p>	<p style="text-align: center;"><b>S2-1A-5</b></p> <p style="text-align: center;">C:\EDAXProjects\OlgaforHallID\S2_1_2\S2-1a-5-no W.spc</p>  <p style="text-align: center;">EDS Analysis. No W</p>
<p style="text-align: center;"><b>S2-1A-7 Environmental contamination</b></p>  <p style="text-align: center;">Magnification: 45000x</p>	<p style="text-align: center;"><b>S2-1A-7 Environmental contamination</b></p> <p style="text-align: center;">C:\EDAXProjects\OlgaforHallID\S2_1_2\bmp\S2-1a-7-str peaks.spc</p>  <p style="text-align: center;">EDS Analysis. Environmental contamination</p>

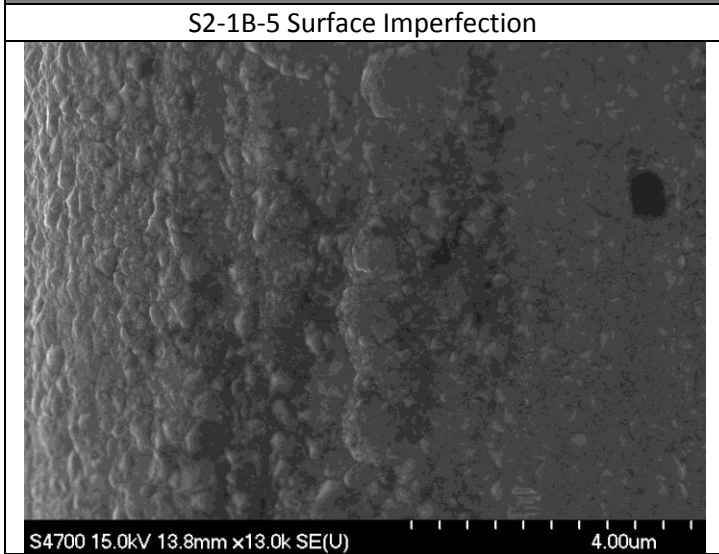




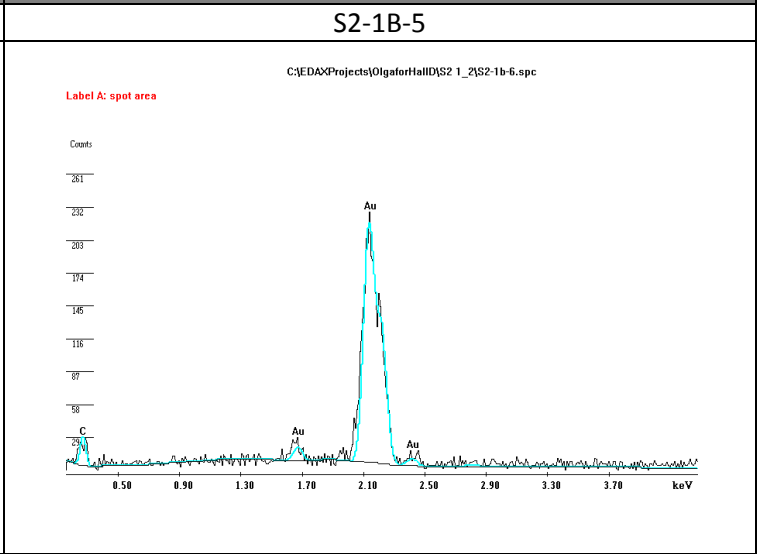
Magnification: 30000x



EDS Analysis. Environmental contamination



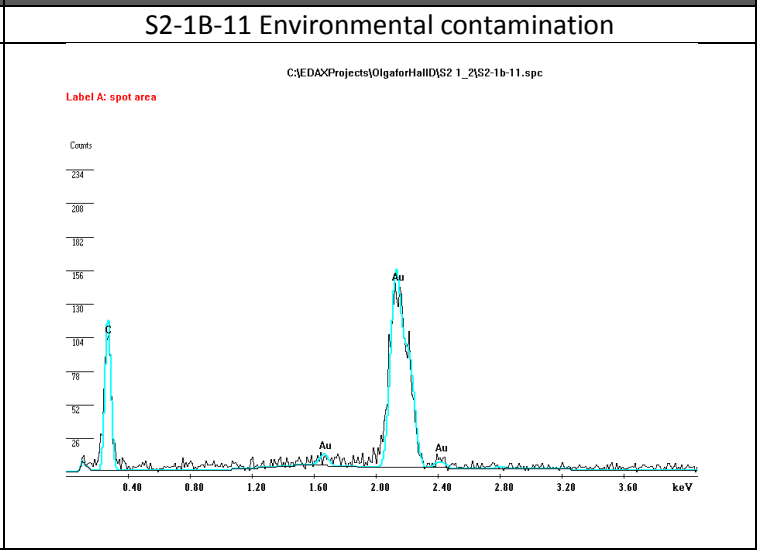
Magnification: 13000x



EDS Analysis. No W



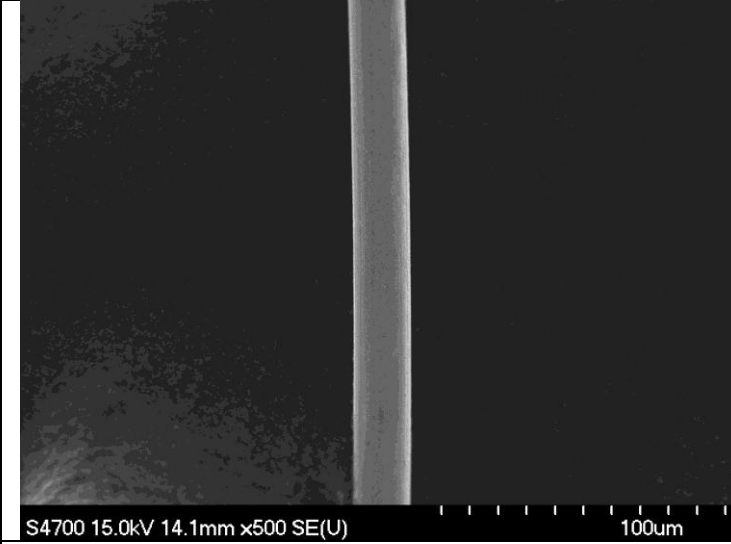
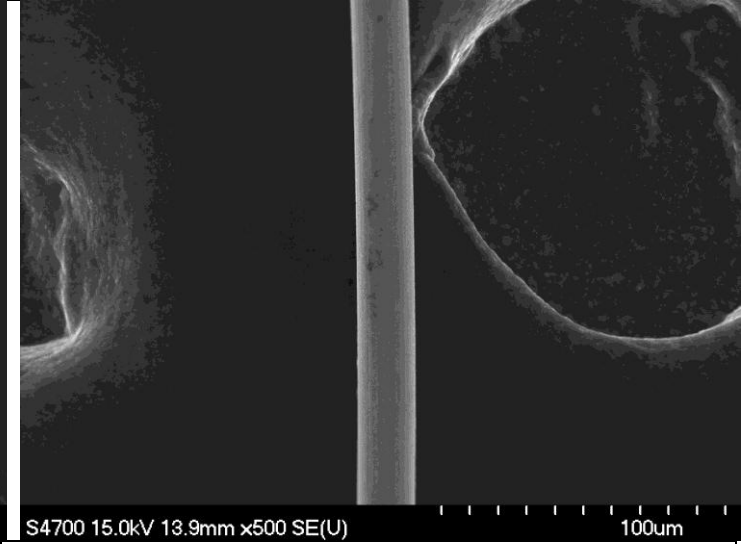
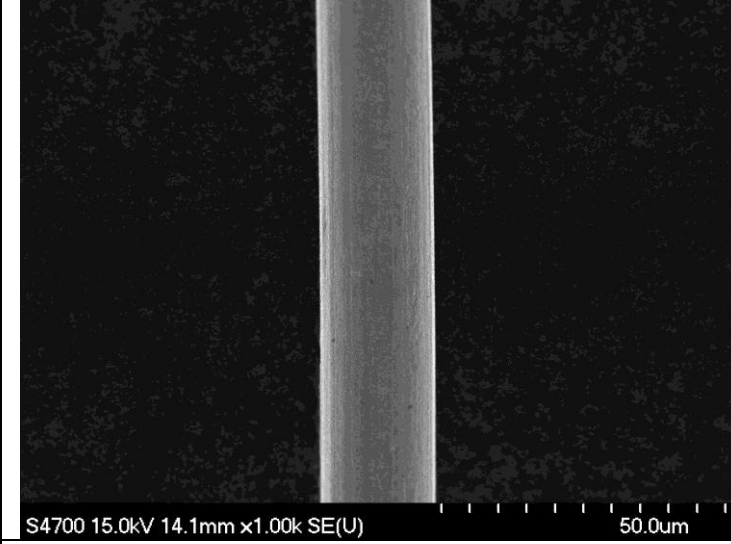
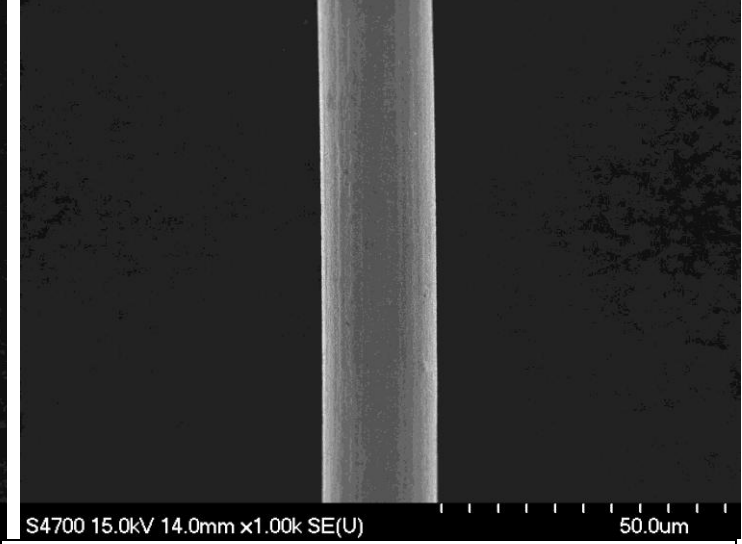
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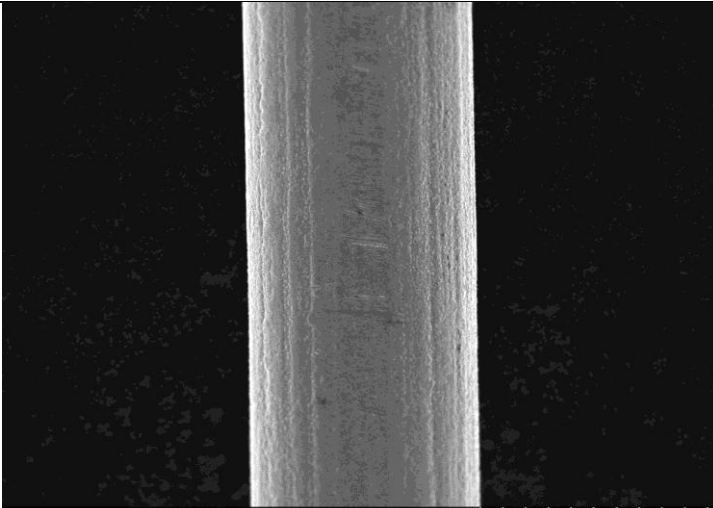
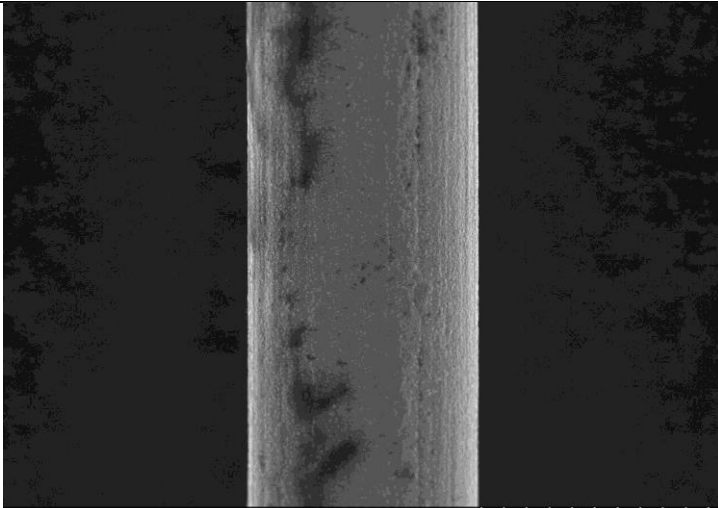
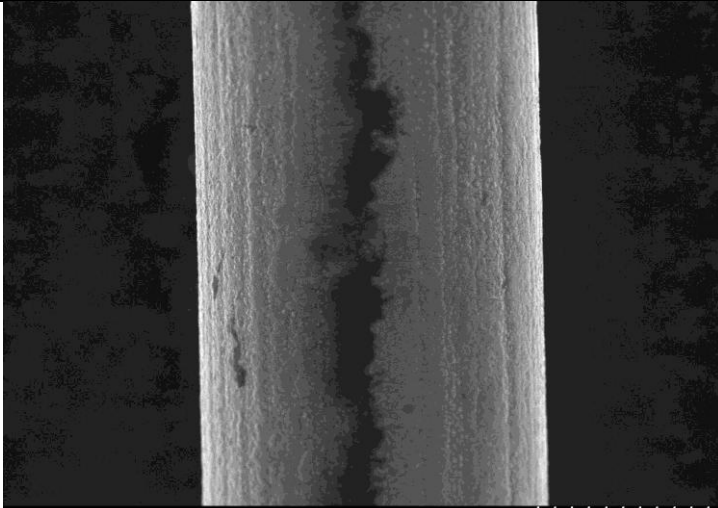


EDS Analysis. Carbon contamination

# Sample S2-2 A, B

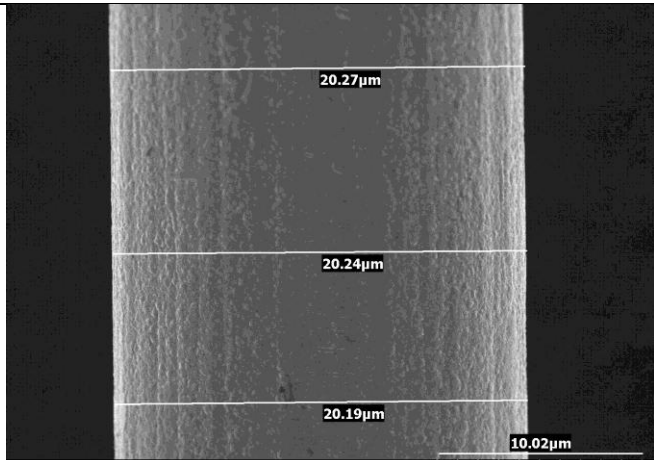
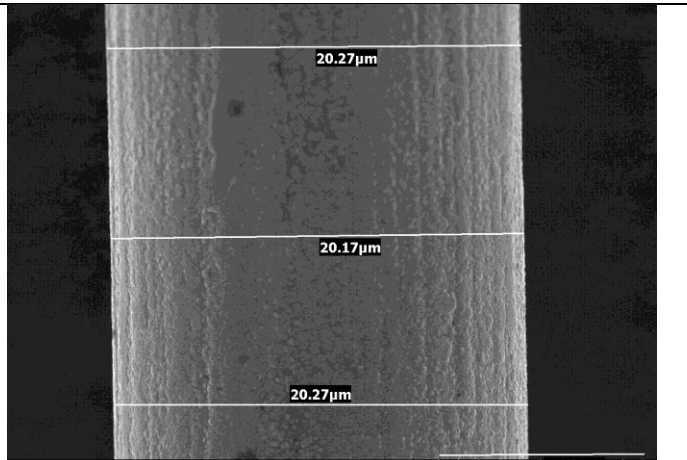
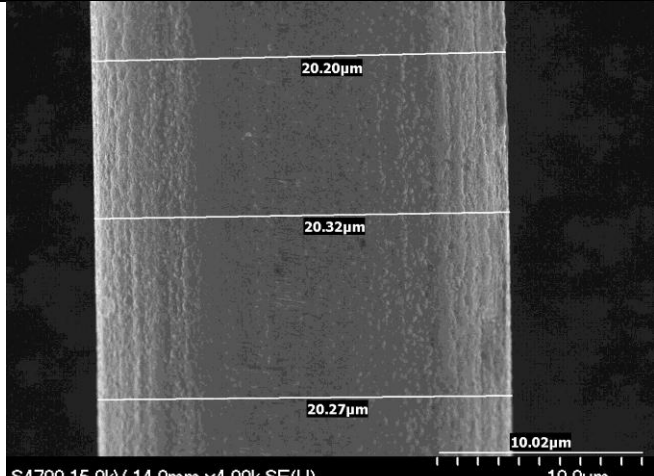
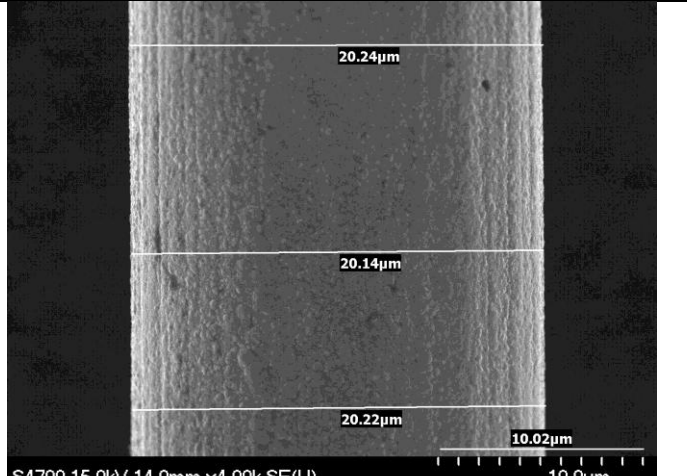
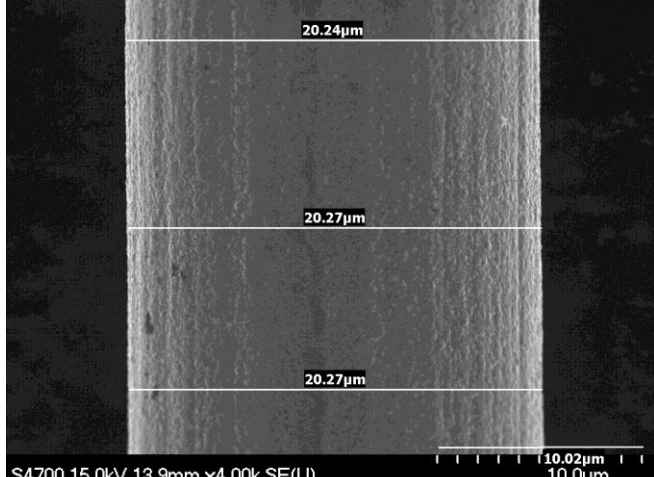
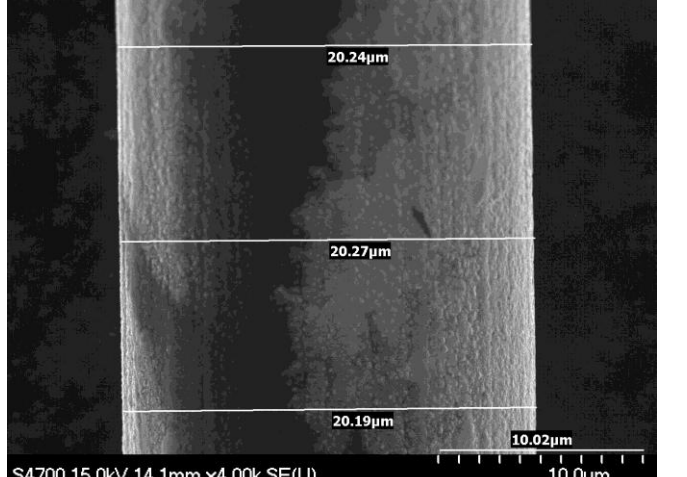
## I. Images at designated magnifications

S2-2A-1	S2-2B-1
	
Magnification: 500x	Magnification: 500x
S2-2A-2	S2-2B-2
	
Magnification: 1000x	Magnification: 1000x

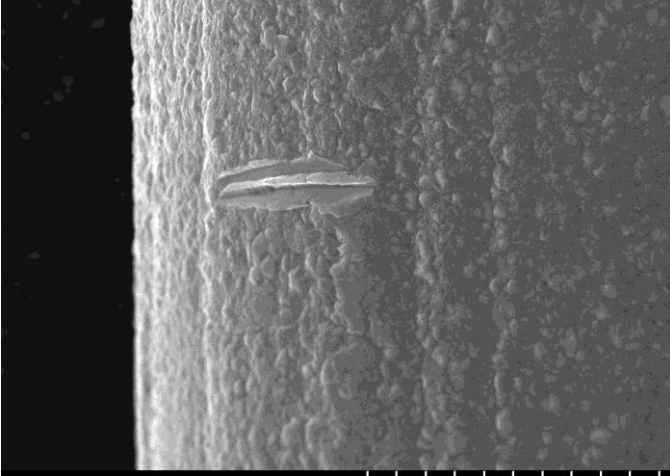

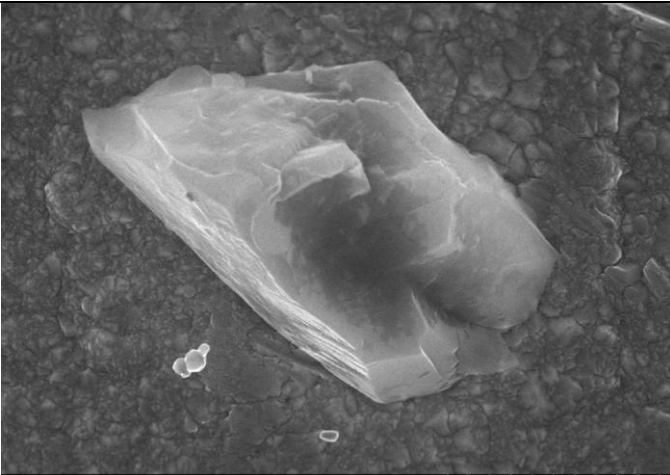
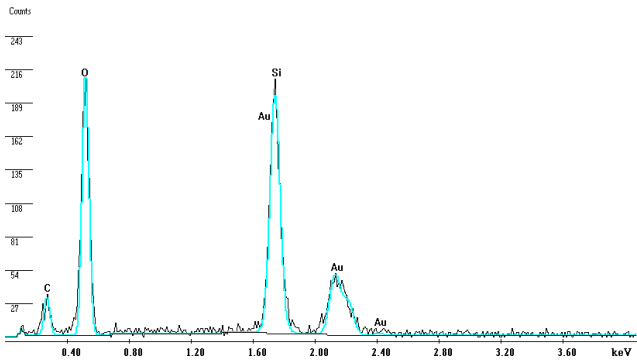

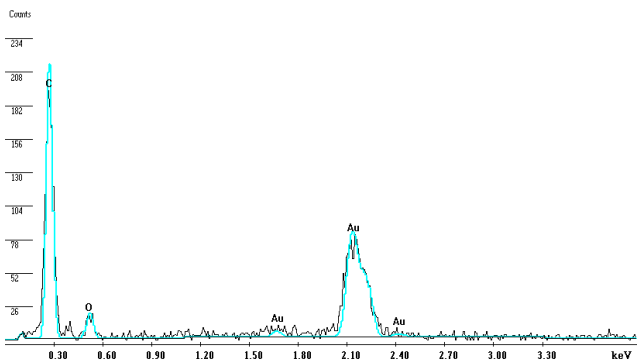
<p style="text-align: center;">S2-2A-3</p>  <p style="text-align: center;">Magnification: 2000x</p>	<p style="text-align: center;">S2-2B-3</p>  <p style="text-align: center;">Magnification: 2000x</p>
<p style="text-align: center;">S2-2A-4</p> <p style="text-align: center;">Sorry, image was not saved by accident.</p>	<p style="text-align: center;">S3-2B-4</p>
<p style="text-align: center;">Magnification: 3000x</p>	 <p style="text-align: center;">Magnification: 3000x</p>



## II. Ovality Measurements

<p>S2-2A-1o</p>  <p>20.27<math>\mu\text{m}</math> 20.24<math>\mu\text{m}</math> 20.19<math>\mu\text{m}</math> 10.02<math>\mu\text{m}</math> S4700 15.0kV 14.1mm x4.00k SE(U) 10.0<math>\mu\text{m}</math></p>	<p>S2-2B-1o</p>  <p>20.27<math>\mu\text{m}</math> 20.17<math>\mu\text{m}</math> 20.27<math>\mu\text{m}</math> 10.02<math>\mu\text{m}</math> S4700 15.0kV 14.0mm x4.00k SE(U) 10.0<math>\mu\text{m}</math></p>
<p>Magnification: 4000x</p>	<p>Magnification: 4000x</p>
<p>S2-2A-2o</p>  <p>20.20<math>\mu\text{m}</math> 20.32<math>\mu\text{m}</math> 20.27<math>\mu\text{m}</math> 10.02<math>\mu\text{m}</math> S4700 15.0kV 14.0mm x4.00k SE(U) 10.0<math>\mu\text{m}</math></p>	<p>S2-2B-2o</p>  <p>20.24<math>\mu\text{m}</math> 20.14<math>\mu\text{m}</math> 20.22<math>\mu\text{m}</math> 10.02<math>\mu\text{m}</math> S4700 15.0kV 14.0mm x4.00k SE(U) 10.0<math>\mu\text{m}</math></p>
<p>Magnification: 4000x</p>	<p>Magnification: 4000x</p>
<p>S2-2A-3o</p>  <p>20.24<math>\mu\text{m}</math> 20.27<math>\mu\text{m}</math> 20.27<math>\mu\text{m}</math> 10.02<math>\mu\text{m}</math> S4700 15.0kV 13.9mm x4.00k SE(U) 10.0<math>\mu\text{m}</math></p>	<p>S2-2B-3o</p>  <p>20.24<math>\mu\text{m}</math> 20.27<math>\mu\text{m}</math> 20.19<math>\mu\text{m}</math> 10.02<math>\mu\text{m}</math> S4700 15.0kV 14.1mm x4.00k SE(U) 10.0<math>\mu\text{m}</math></p>
<p>Magnification: 4000x</p>	<p>Magnification: 4000x</p>

## II. Points of Interest

<p style="text-align: center;">S2-2A-4 Scratch.</p>  <p>S4700 15.0kV 14.1mm x11.0k SE(U) <span style="float: right;">5.00um</span></p>	<p style="text-align: center;">S2-2A-7 Surface damage. No W.</p>  <p>S4700 15.0kV 14.0mm x6.00k SE(U) <span style="float: right;">5.00um</span></p>
<p style="text-align: center;">Magnification: 11000x</p>	<p style="text-align: center;">Magnification: 9000x</p>
<p style="text-align: center;">S2-2A-4 Crystal.</p>  <p>S4700 15.0kV 14.1mm x20.0k SE(U) <span style="float: right;">2.00um</span></p>	<p style="text-align: center;">S2-2A-4 Crystal.</p> <p style="text-align: right; font-size: small;">C:\EDAX\Projects\OlgaforHallID\S2_1_2\S2-2a-4 crystal.spc</p> <p style="font-size: x-small;">Label A: spot area</p>  <p style="text-align: center;">EDS analysis. Silicon particle.</p>
<p style="text-align: center;">Magnification: 20000x</p>	<p style="text-align: center;">EDS analysis. Silicon particle.</p>
<p style="text-align: center;">S2-2B-3</p>  <p>S4700 15.0kV 14.0mm x5.00k SE(U) <span style="float: right;">10.0um</span></p>	<p style="text-align: center;">S2-2B-3 Environmental contamination</p> <p style="text-align: right; font-size: small;">C:\EDAX\Projects\OlgaforHallID\S2_1_2\S2-2b-3 flake.spc</p> <p style="font-size: x-small;">Label A: spot area</p>  <p style="text-align: center;">EDS analysis. Carbon contamination.</p>
<p style="text-align: center;">Magnification: 5000x Environmental contamination.</p>	<p style="text-align: center;">EDS analysis. Carbon contamination.</p>

### III. Points of Interest Density Estimation.

Estimation of surface imperfections, such as mechanical damage and all kinds of contamination, could be only very approximate. The samples were examined at magnification of  $\sim x1000$  in fast scan regime, which does not allow to observe very tiny imperfections.

Two pieces of wire were examined along the length of about 20mm each (normal length of observation for all the samples): S2-1A and S2-1B.

Registered number of points of interest:

S2-1A	43
S2-1B	11

Sample S2-1B had fewer imperfections along its length, but had several patches of carbon contamination (counted as one point of interest each) at one end, which could probably occur as a result of sample installation on a carbon tape.