

Imaging and EDS on silver and zinc coated textile sample

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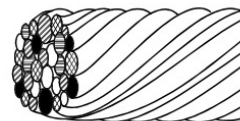
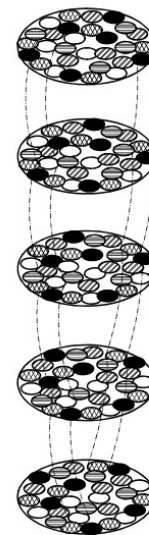


Fig. 1



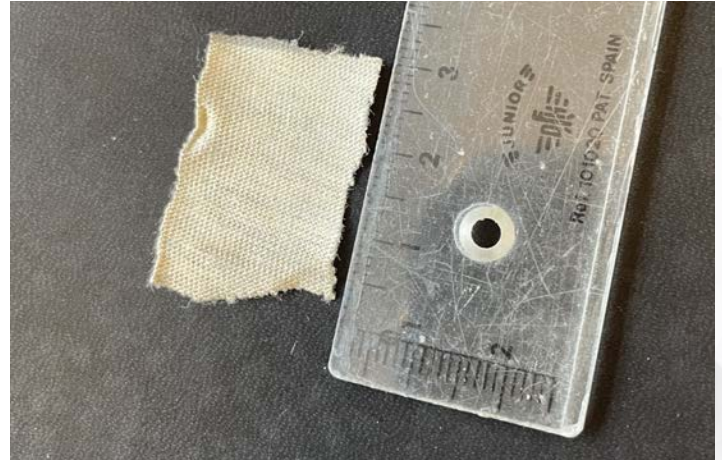
- Silver coated fiber
- Cellulose fiber with incorporated organic seaweed
- ▨ Ramie fiber
- ▩ Soybean fiber
- ◐ Cellulose fiber with zinc

Sample

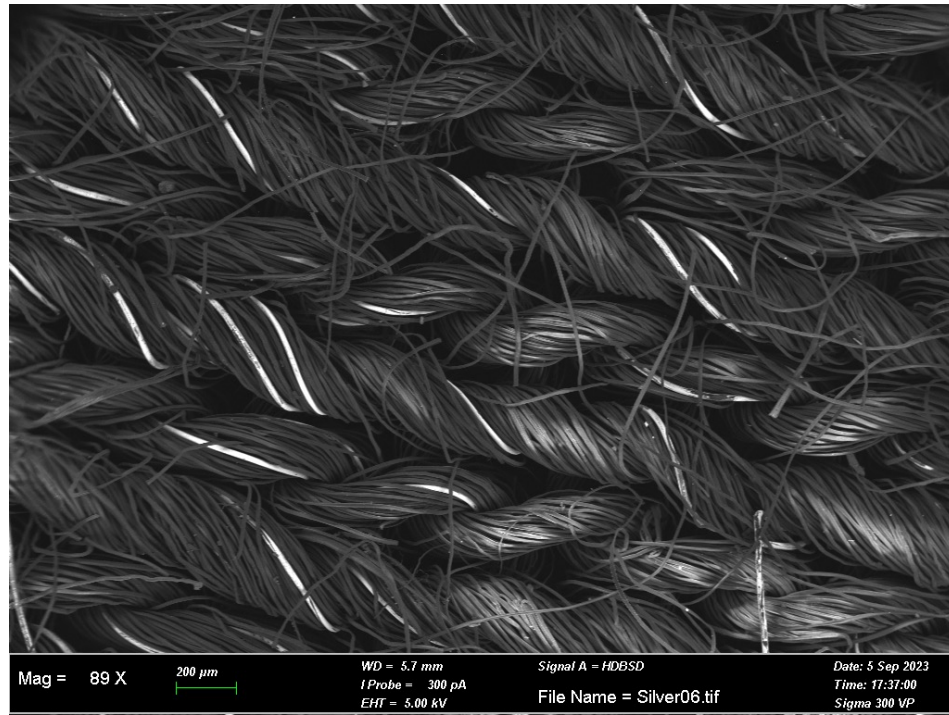
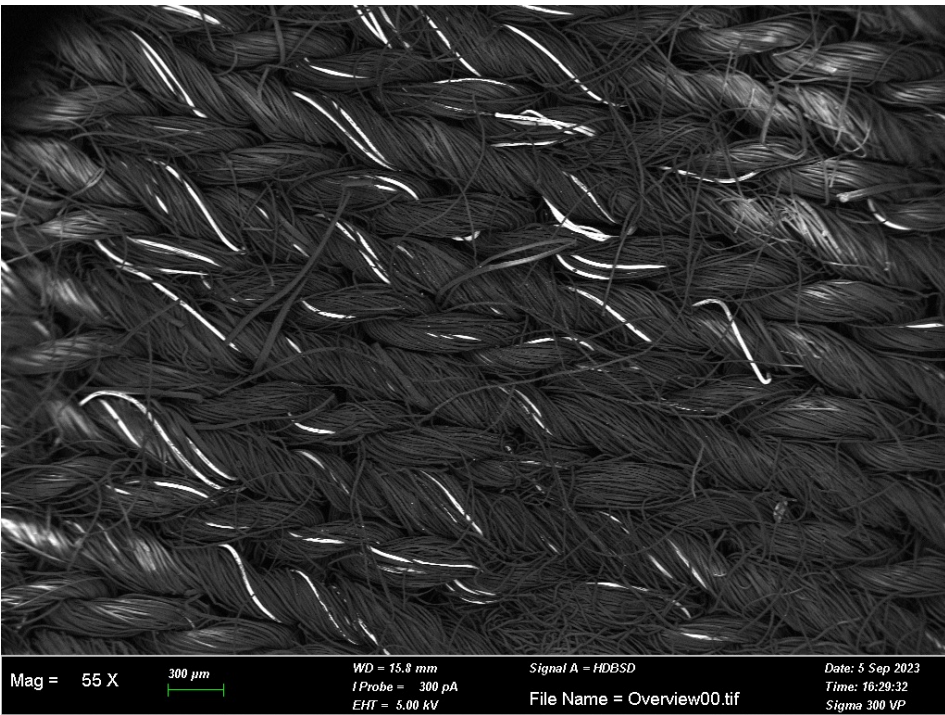
Piece of textile was delivered 2023-09-06 to Swerim

Following analysis was performed:

- SEM imaging from the top of sample
- Cross section SEM and EDS analysis from the cross section after gold sputtering (2 min exposure, aiming for ~ 20 nm thick layer)
- SEM/EDS analysis were performed using Sigma 300VP SEM instrument with 6kV acceleration voltage and 300pA current.

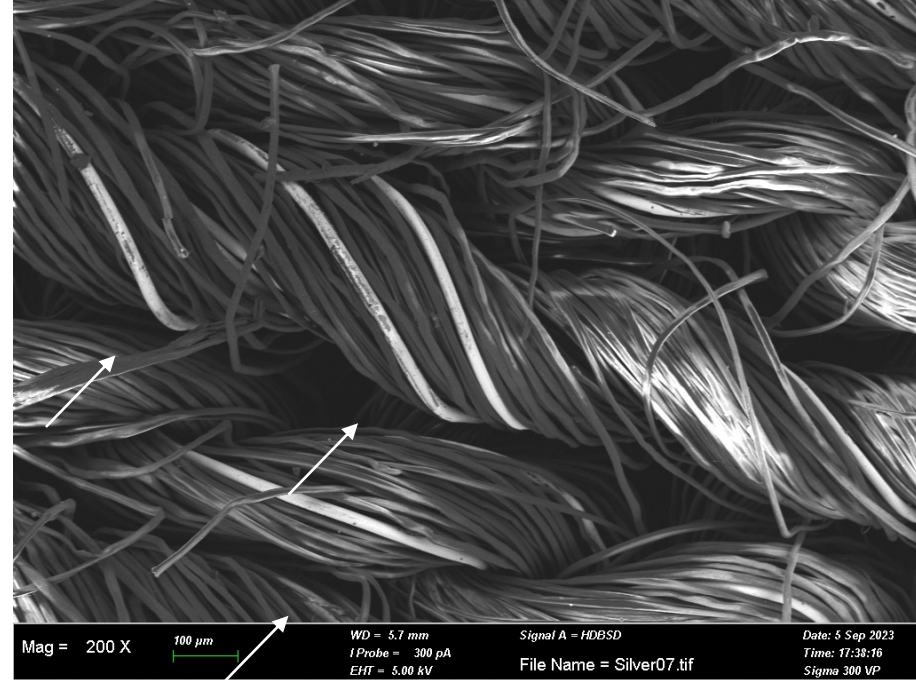
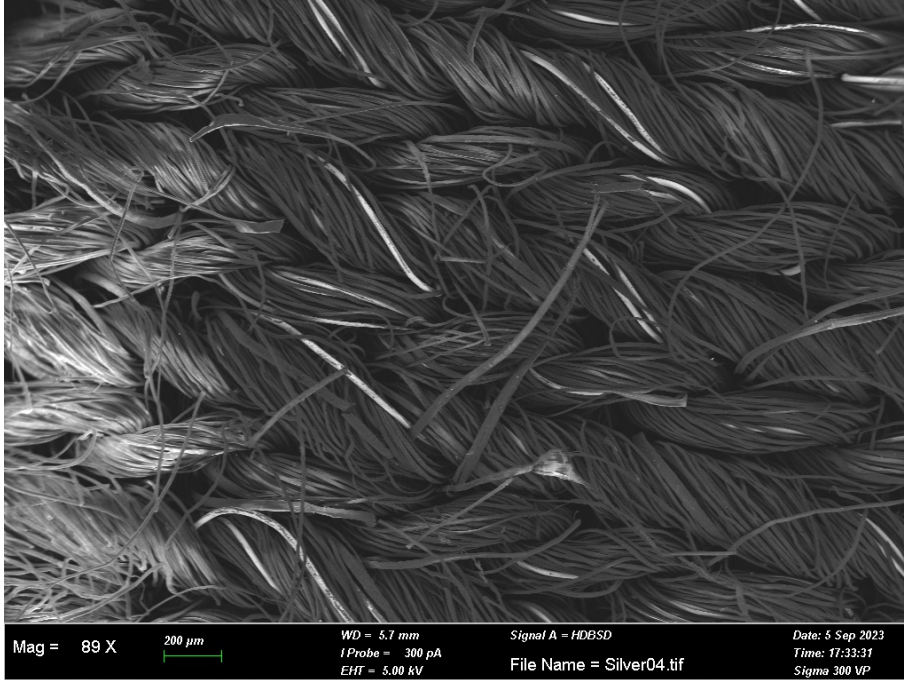


Overview from the top



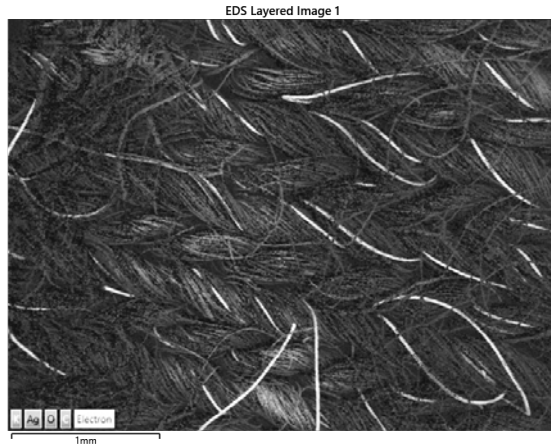
Some charging effect due to low concentration of conductive threads (Ag), but the Ag threads are clearly seen in white. Zn coated fibers did not show, this is probably due to the thin Zn-coating. Zn also has a lower atom weight.

Overview images

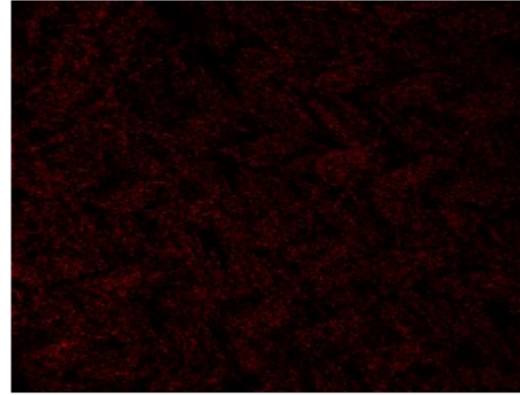


Again charging effects due to low conductive threads, but the Ag threads are clearly seen in white. The silver layer seems to be thin and complete coverage have not been obtained.

EDS analysis

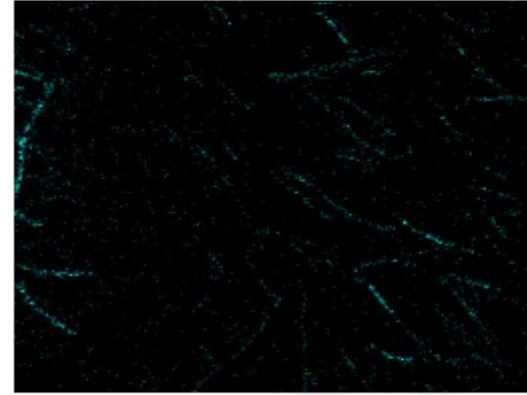


C K series



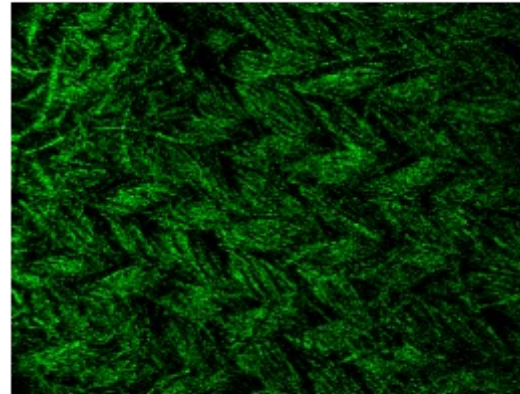
1mm

Ag L series



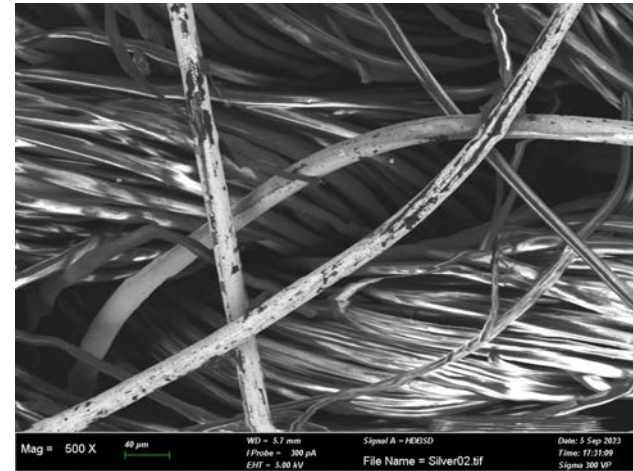
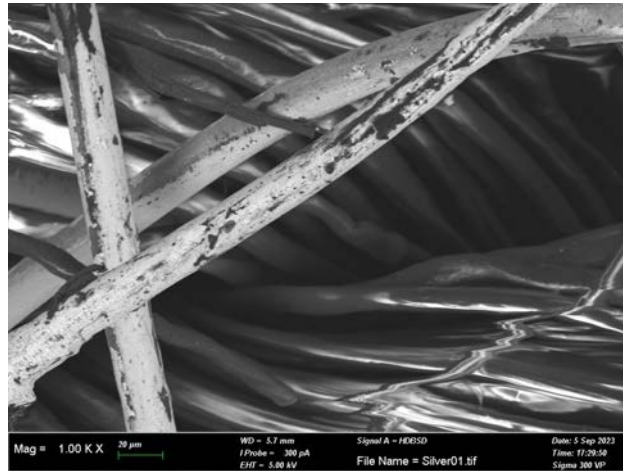
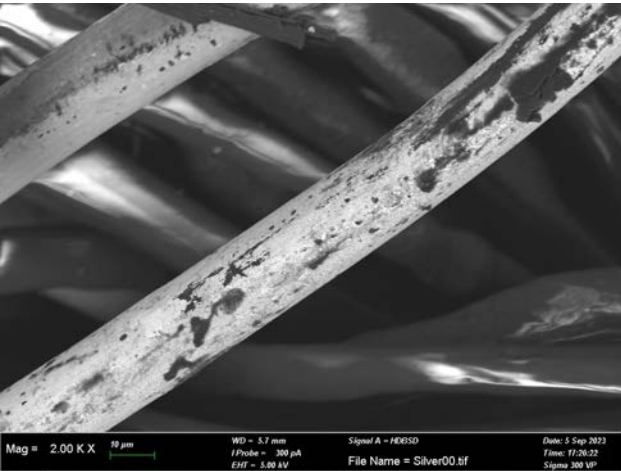
1mm

O K series



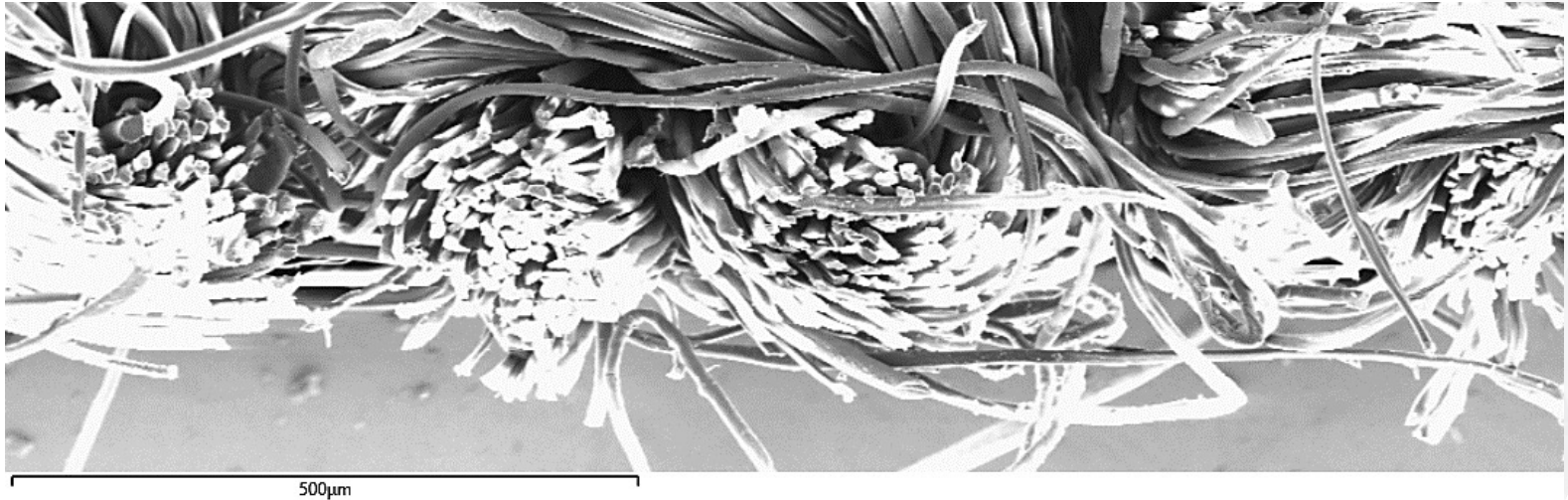
1mm

Some of the silver threads



Cross section analysis

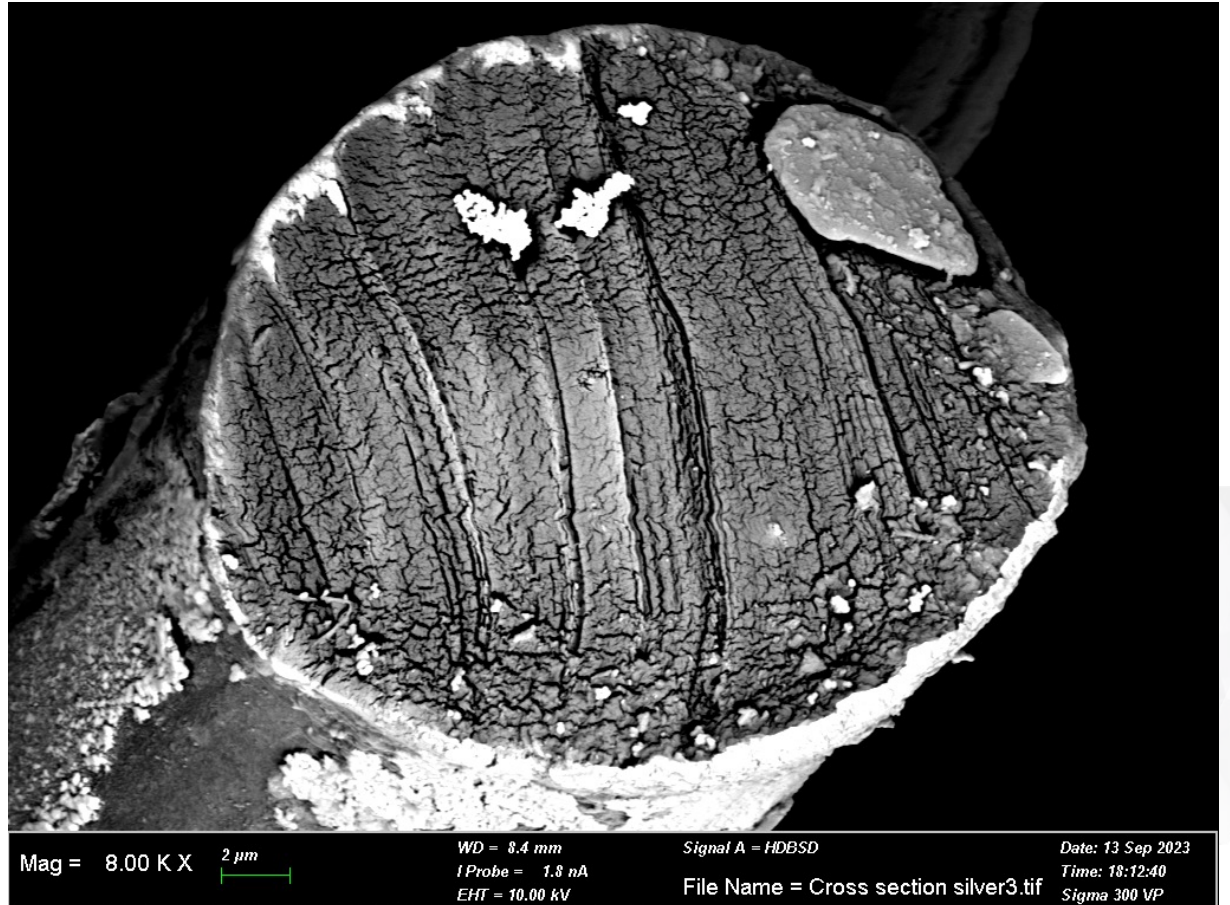
To avoid the charging effect, after cutting the sample with razor blade, half of the sample was coated with gold for easier imaging.



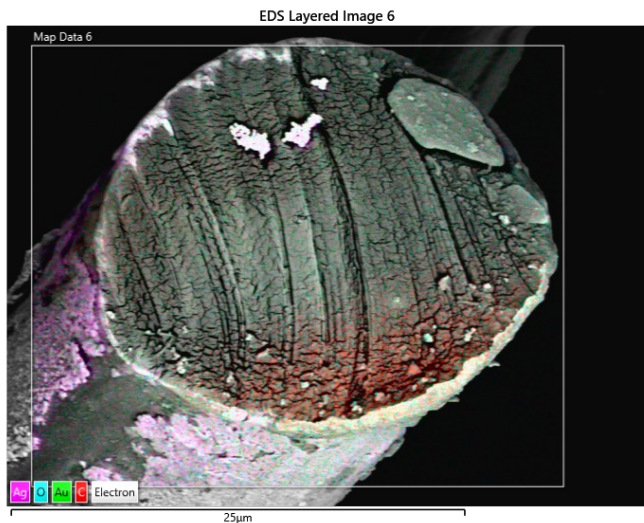
Cross section

Thread with silver coating
Thickness of Ag coating
 $\leq 1\mu\text{m}$

This SEM image was
captured using 10kV
acceleration voltage and
1.8 nA current.

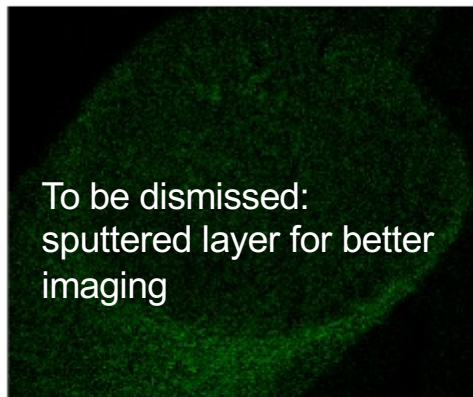


EDS analysis

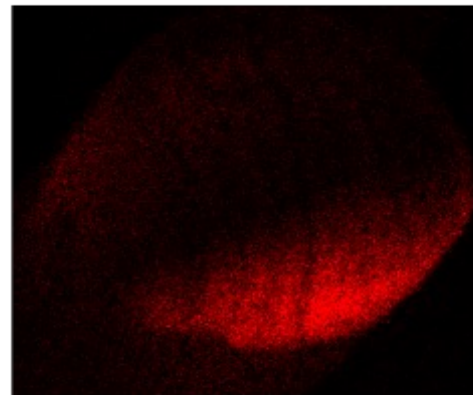


This EDS image was captured using 10kV acceleration voltage and 1.8 nA current.

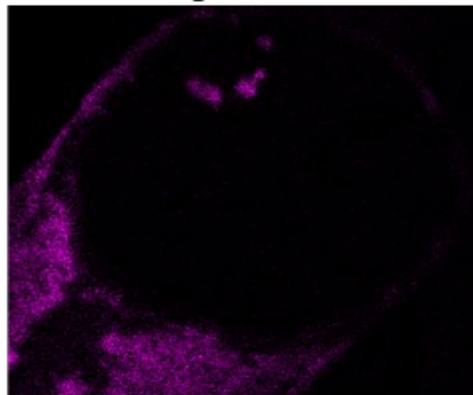
Au M series



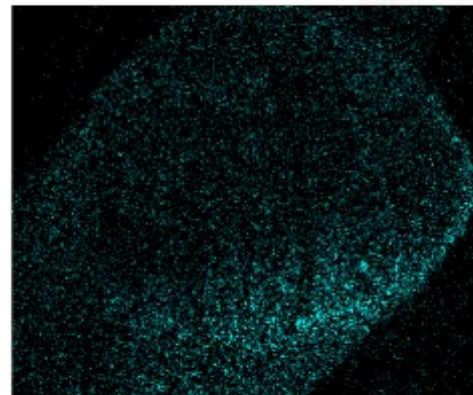
C K series



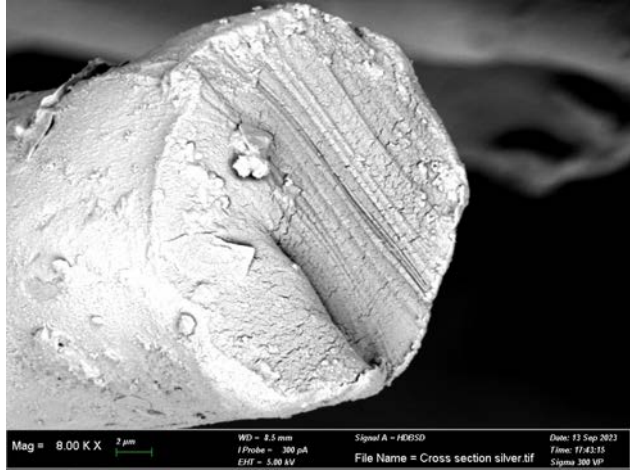
Ag L series



O K series



More images of threads



Point analysis using EDS



Label	C	O	Fe	Ag	Total
Inner part	77,1	14,6	7,7	0,5	100
Coating	26,3	4,4	2,8	66,5	100

Values are presented in wt.%



Exploring for Zn threads

Sample preparation

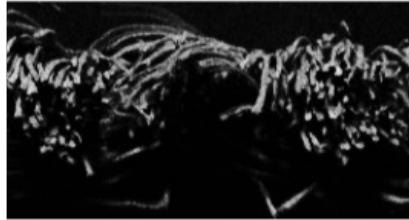
Zn signal was found to be very weak. The contrast was not enough for imaging with back scattered detector. Long EDS mapping (overnight) showed clear Zn signal.

Sample was coated with C from the top and cross section. Carbon sputtering was performed using Leica EM ACE600 with a carbon thread source, working distance 30 mm, Double Pulse mode, aiming at 5 nm thick carbon layer.

EDS scan was performed using Sigma 300VP SEM instrument with 6kV acceleration voltage and 350pA current.

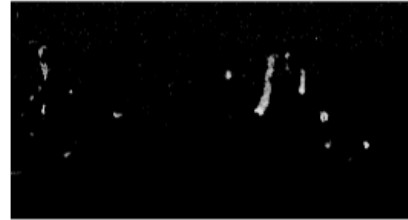
EDS results from cross section of sample

C K series



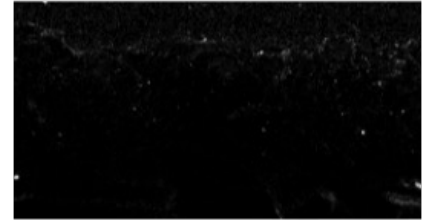
250µm

Zn L series



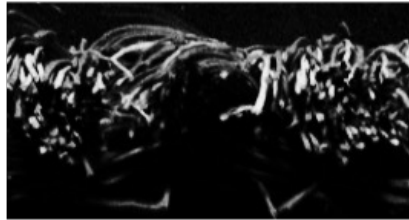
250µm

Si K series



250µm

O K series



250µm

Na K series

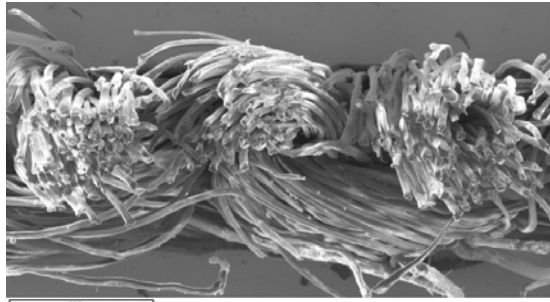


250µm

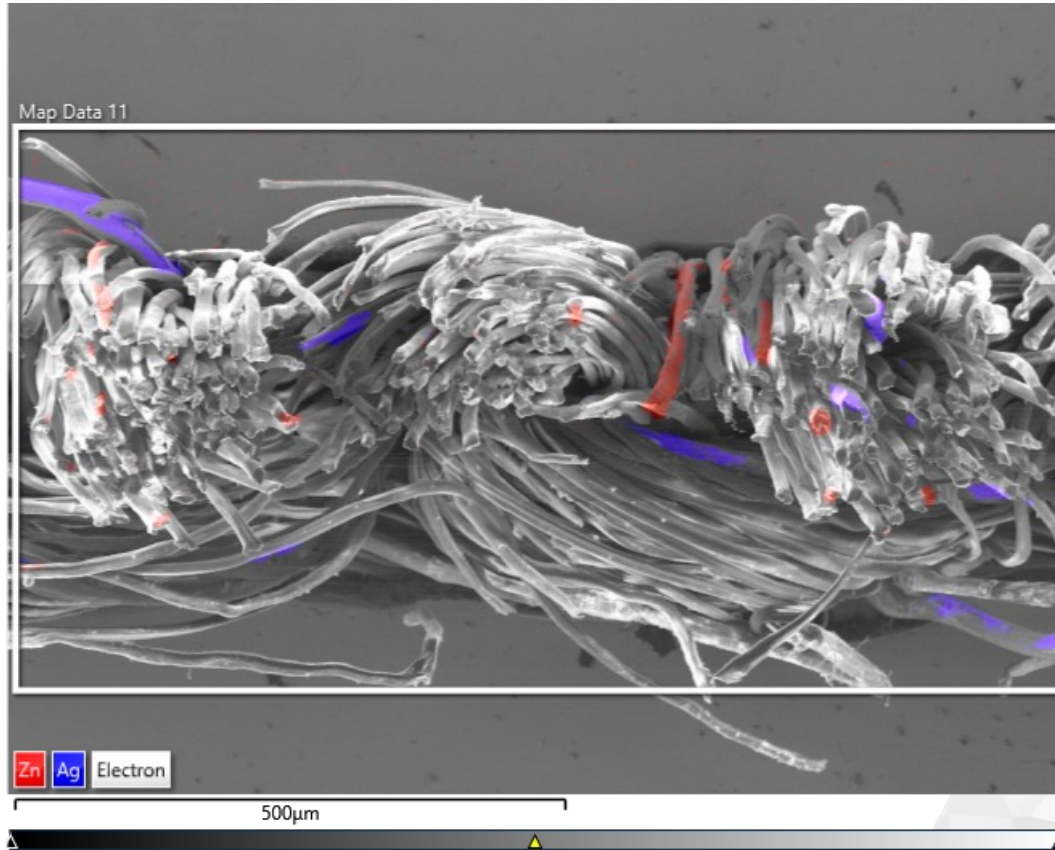
Ag L series



250µm

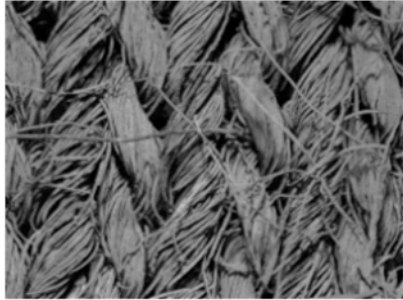


Cross section EDS overlaid with SEM image



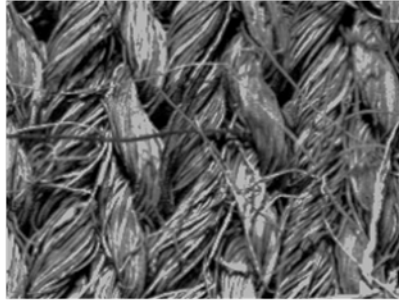
EDS results from top of sample

C K series



500μm

O K series



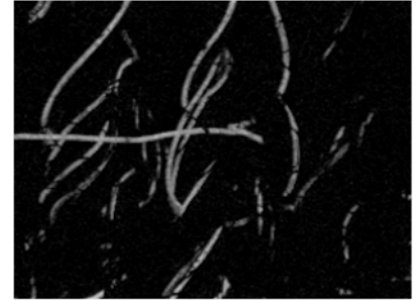
500μm

Zn L series



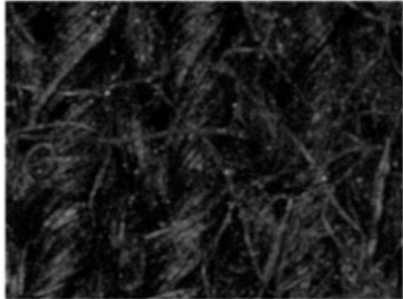
500μm

Ag L series



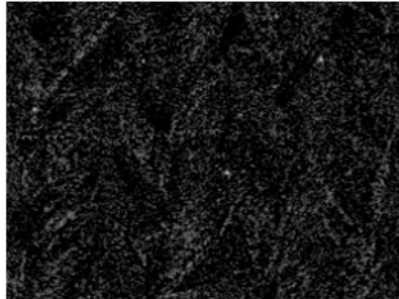
500μm

Si K series



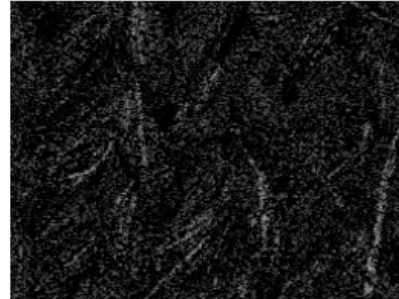
500μm

Al K series



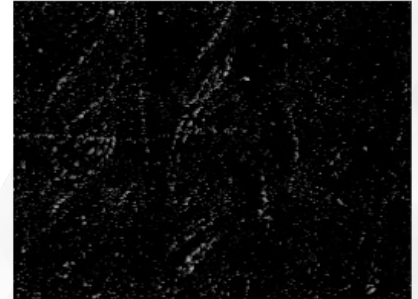
500μm

Na K series



500μm

N K series



500μm

EDS results from top of sample

