Electron Microscope Analysis of Nu-FLOW

Objectives:

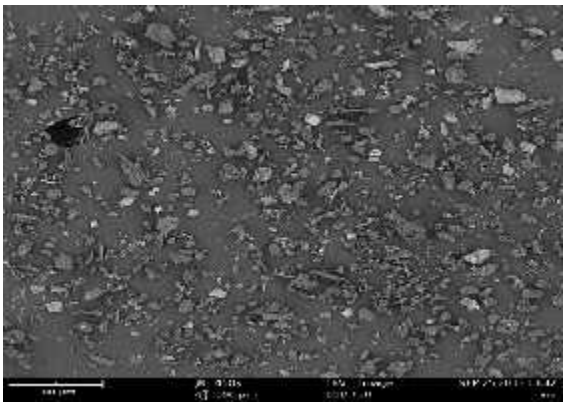
1. Obtain photos of the shapes, sizes and structure of individual particles of Nu-FLOW
2. Determine if the Silica visible
3. Determine the distribution and concentration of Silica in individual particles

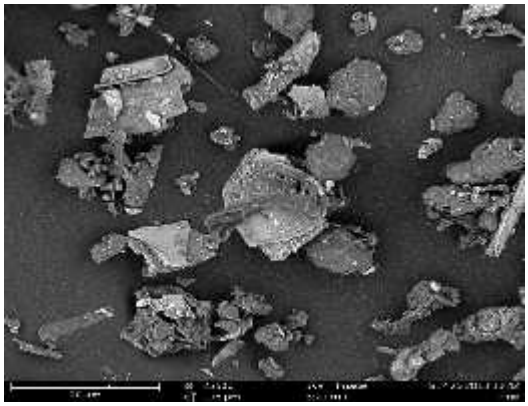
Method:

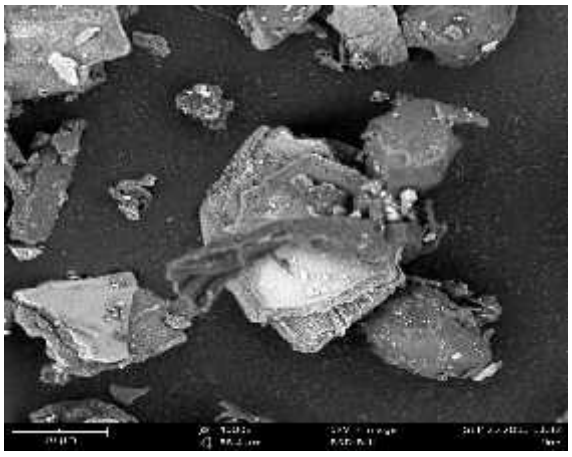
1. Small amounts of Nu-FLOW powder where deposited on a carbon adhesive sticker attached to an aluminum stub. Any loose particles where blown off using compressed air.
2. Equipment: Electron Microscope
    a. Phenom ProX tabletop SEM
    b. Source: Alfa Test, Rome, Italy (Dr. Fabio De Simone)
3. Begin with low magnification to obtain broad mages, then intensify to obtain additional details

Observation Data / Images:

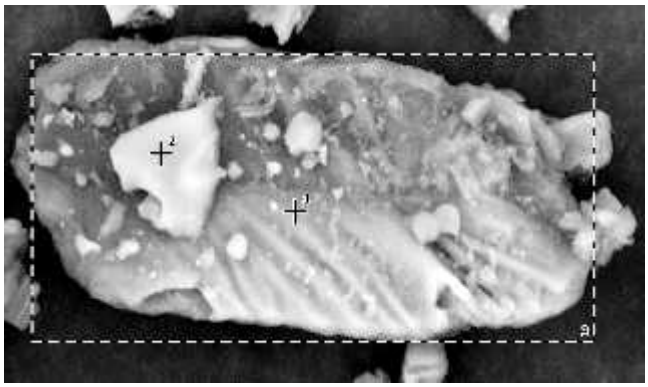
1. General Images



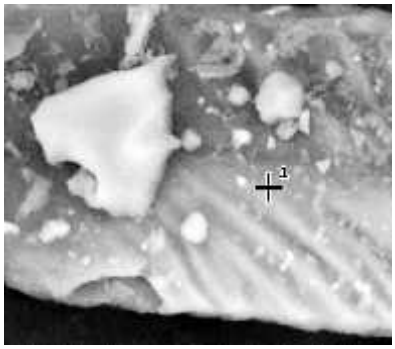


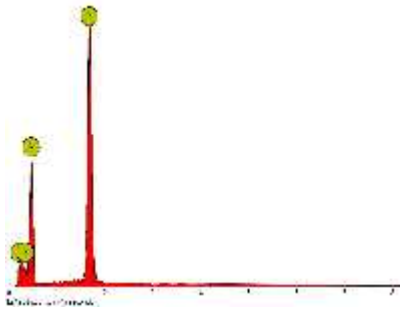


2. Nu-FLOW, specific particle analysis: size, 60 microns



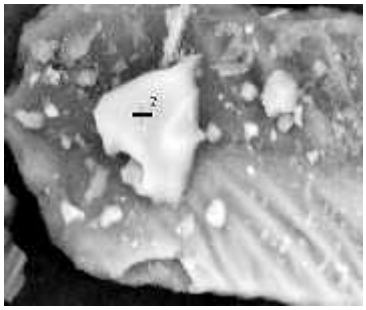
a. Analysis of Spot #1, to determine if a specific visible spot was Silica.

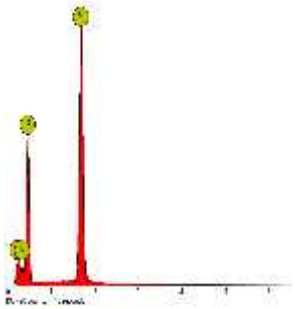




Element Number	Symbol	Element	Confidence	Concentration	Error
14	Si	Silicon	Manual	23.5	0.5
8	O	Oxygen	Manual	67.7	0.8
6	C	Carbon	Manual	2.3	2.3
7	N	Nitrogen	Manual	6.5	2.3

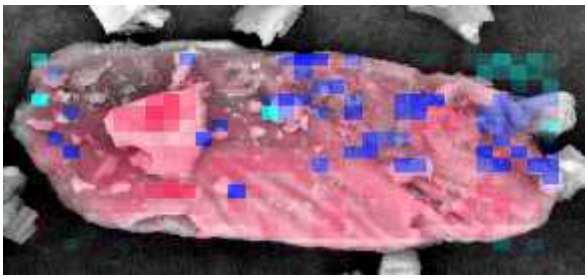
b. Analysis of Spot #2, to determine if a specific visible spot was Silica.

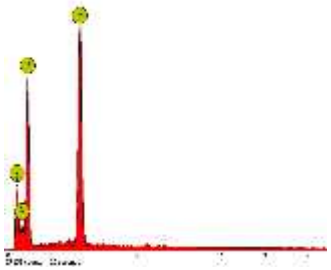




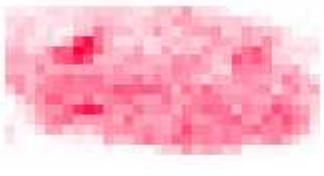
Element Number	Symbol	Element	Confidence	%	Error
14	Si	Silicon	Manual	21.9	0.4
8	O	Oxygen	Manual	69.7	0.6
6	C	Carbon	Manual	2.3	1.7
7	N	Nitrogen	Manual	6.1	1.8

c. Surface Map of particle to determine the distribution of Silica (shows pink in color with the periodic table overlay).

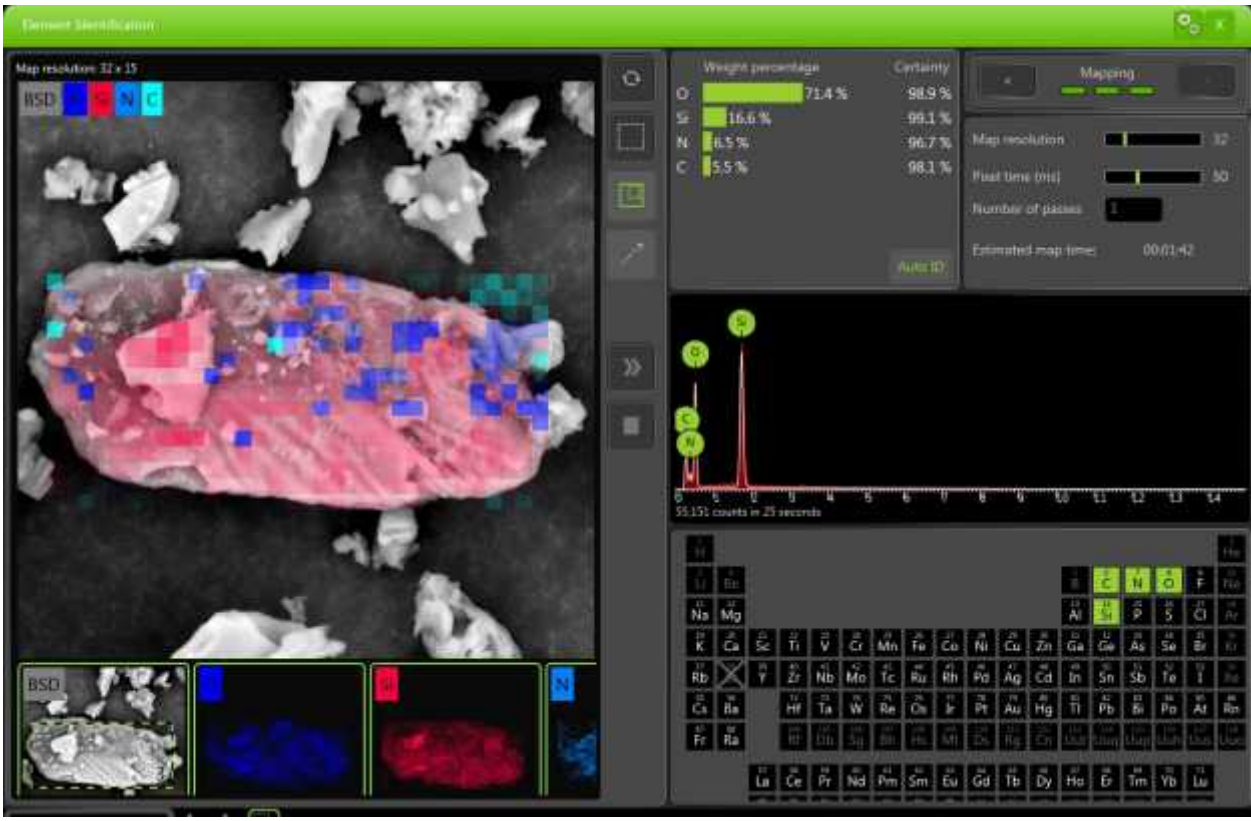




Element Number	Symbol	Element	Confidence	%	Error
14	Si	Silicon	100.0	16.6	0.9
8	O	Oxygen	100.0	71.4	1.1
6	C	Carbon	100.0	5.5	1.9
7	N	Nitrogen	100.0	6.5	3.3



Map: Silica (resolution: 32x15 pixels)



Observation Analysis:

1. The product has random shapes and particle sizes
2. The product is less than the 70 micron size and in compliance with specifications
3. Silica is present throughout the fiber

Conclusion:

1. The Objectives were met and documented, due to the abilities of the nature of the equipment and operator.
2. The uniform dispersion of silica throughout the fiber matrix, helps to explain how the product provides anti-caking functionality (from the silica placement) and high load capacity (moisture and oil absorption characteristics from the fiber).