

For DWOI

Environment Monitoring For an Asbestos Plant in Kymore

Capacity Building and Training

Environics Trust
28-Dec-21

ABOUT THE PROJECT

As secretariat of the Indian Ban Asbestos Network, Environics Trust has been engaged in activities to identify Asbestos victims throughout the country. We have also been instrumental in challenging the remediation of all closed asbestos mines in the country by filing cases in the National Green Tribunal¹ and organizing medical camps in the mineral regions.

Asbestos is potentially hazardous to human health; people get exposed to asbestos fibers during handling of fibre in industries, loading, living in buildings having damaged roofs and potential environmental exposure where manufacturing plants are in operation like Kymore. People at risk are workers and their families, but there is a high potential for environmental exposure in such areas. It is important to recognize that the majority of people who have developed diseases because of asbestos exposure



worked in occupations where asbestos as a raw material is used. The workers frequently get exposed to asbestos fibers each working day, with little or no protection. The communities living near Everest industry, Kymore (the field location in this case) are also at the risk of exposure to this deadly fiber.

As part of the project, the concentrations of the actual mineral in the ambient air quality were to be identified and the investigation was planned to be used concurrently with other visual evidence. This was part of evidence gathering which was intended to be used in advocacy with the concerned authorities of the Government. The evidence gathered would provide a holistic understanding about the presence of asbestos fiber in the ambient air. Industrial compliance remains uncontested in such situations due to lack of scientific data; this program aimed to bridge the gap and provide authentic data to support in such instances. The project was intended to validate the argument of inefficient regulatory mechanisms like mishandling of hazardous waste as required by the Central Pollution Control Board² and not following stringent environmental regulatory mechanisms prescribed by the Ministry of Environment, Forest and Climate Change for Asbestos Handling³.

BACKGROUND OF KYMORE AND EVEREST INDUSTRIES

Established in 1934, in Katni, Madhya Pradesh, this is the first plant in India that was set up to manufacture Asbestos Fibre-Cement Roofing Sheets & Accessories. The Company was incorporated in the name and style Asbestos Cement Ltd., as a private limited company under the Indian Company's Act, VII of 1913 with two corporate shareholders viz., C.P. Cement Co. Ltd. and Turner & Newall Ltd., U.K. The manufacturing business was expanded progressively by establishing a second sheeting factory at Mulund (Mumbai) in 1937, the third factory at Calcutta in October 1938, and the fourth factory at Podanur near Coimbatore in Tamil Nadu in November 1953.

¹ A tribunal established under the National Green Tribunal Act 2010 to entertain environmental cases

² [regulatory mechanisms like mishandling of hazardous waste as required by the Central Pollution Control Board](#)

³ [environmental regulatory mechanisms prescribed by the Ministry of Environment, Forest and Climate Change for Asbestos Handling.](#)

Everest Industries in Kymore has been functional and the majority of the raw fiber (chrysotile) is imported from Russia. *UralAsbest*⁴ is one of the key suppliers of raw fiber of chrysotile in India. **734** of cases of Asbestos-Related Diseases have been diagnosed by IBAN members in Kymore out of which **393** were **secondary/environmental exposure**. This number will keep on increasing due to the lack of efficient monitoring and implementation of rules by the state pollution control board and other authorities. The factory management used to dump all its waste outside the premises till a few years back. On this vast asbestos dump, a sprawling colony of workers and their families reside. Accommodation for workers have also been constructed by the company in this dump area. Even digging a few inches reveals the white asbestos waste.

The study area of Kymore (Nagar Panchayat) has a population of 19,343 of which 9,913 are males while 9,430 are females as per the Census of India 2011.

OBJECTIVES OF PROJECT

Through this project, we expected to - Conduct community airborne dust sampling around the village (within 1-3 km of the periphery of the Everest Industries Manufacturing unit) to understand and document the concentration of asbestos fibers in the air.

Based on available information and presence of support in the field, it was decided to do an air sampling at Kymore to understand the air quality of the area, especially in the residential colonies around the manufacturing unit. Moreover, a previous study which had been done in 2016 by the Canadian group ECOH, had found many pieces of evidence around Kymore for surficial soil contamination. The current study will help in giving an overview of the current situation, where health risk assessment can be highlighted due to air pollution for those, who are in the direct neighborhood of the plant.

The project was intended to do community monitoring near an Asbestos Plant where the negligence in the regulations can be traced and the existing scenario can be revealed. The town has a history of abrupt muck dump from the plant. The concentrations of the actual minerals in the ambient air quality can be analyzed and the investigation can be used concurrently with other visual affirmations. 29 samples were collected from different locations between 18th – 22nd February 2020. These sampling locations were randomly selected based on the settlement of the communities along with the accessibility of the location within a periphery of 1-3 kilometers.

⁴<http://www.uralasbest.ru/en/about-company>

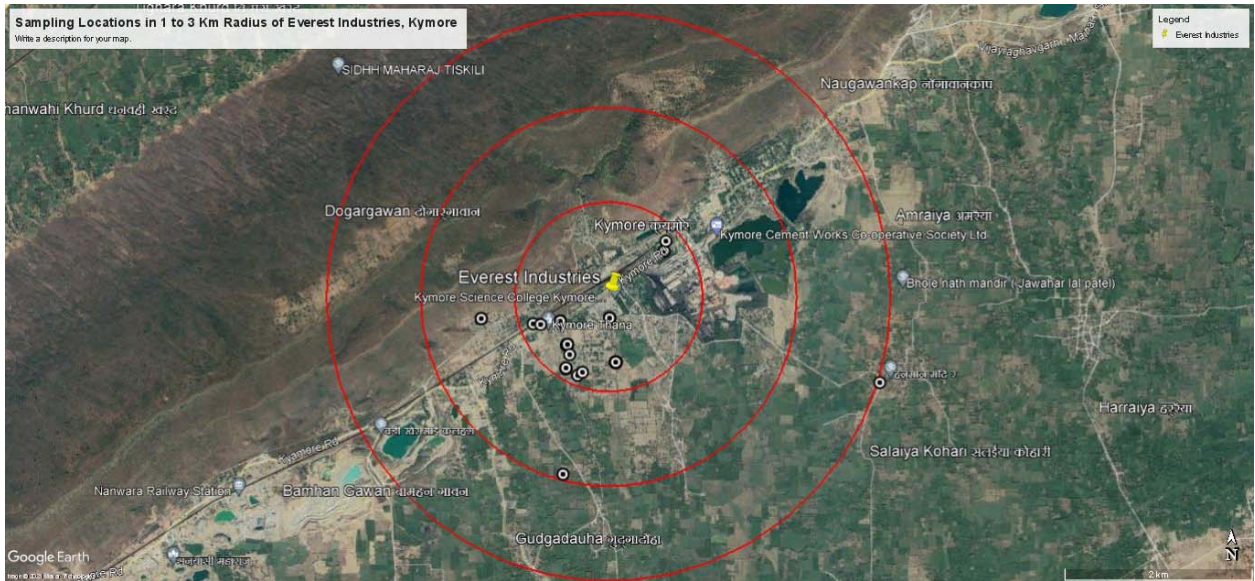


Figure 1- Periphery of sampling and locations

CAPACITY BUILDING AND TRAINING

Under the program, members from Environics Trust had an opportunity to build technical capacity for the air sampling process. With the support of DWOI, SKC Asia donated 5 *AirLite* sampling pumps and the check-mate calibrator, which can be operated with alkaline batteries. Debbie Dietrich from SKC (USA) also donated 2 brand new pumps of the latest model and a calibrator to the project. Karen Gunderson MPH CIH, Developing World Outreach Initiative, American Industrial Hygiene Association helped us with capacity-building before the project.

COMMUNITY AWARENESS

The community residing around Everest Industries has a higher probability of getting contaminated from asbestos fiber, as the white dust can be seen in several places around the town after digging a few inches in the ground (most of the town is located on former waste dumping area of the company). So it was important for the community to understand the need for monitoring and process of sampling. The sampling team made sure to create awareness and share relevant information with them before sampling.

SITES FOR MONITORING

Each identified location was within 1-3 kilometers of the periphery of the identified AC sheet plant. Exposure assessment is a crucial element of environmental epidemiology. Because ARDs have long latency periods of 10 to 50 years⁵, past exposure data is important to evaluate the causal relationship with current ARDs.

The sites selected for sampling were based on the following facts:

1. **Accessibility of the location** – Many people denied setting up the pumps in their residence. This was because they were scared to lose jobs if the company knew about such sampling taking place.

⁵<http://monographs.iarc.fr/ENG/Monographs/vol100/>

2. **Residential Population** – Some locations had more residential houses than others. It was kept in mind to choose more populated places.
3. **Safety of Equipment** - In order to avoid loss or damage
4. **Air Direction** – The air directions were not the same every day, so locations like windows and entry gates were selected where frequent movements take place.
5. **Suggestions from Community** – Some locations were suggested by the community themselves, even though a little distant from the plant, sampling was done there.

Each sample was collected based on the training received during the capacity building. Time, location, GPS and other information were marked and recorded for better analysis in case results were positive (**Appendix 1**).

SAMPLING PROCESS

Successfully collecting, analyzing, and interpreting air samples require a stepwise process. The capacity building was to make people (collecting the samples) understand the work process, the hazards of the air contaminants, the air sampling methods, and laboratory analysis to be used, proper use of air sample collection tools, recordkeeping, sample submission procedure, and how to evaluate the results.

After collection and completion of air sampling, the samples must be submitted to the laboratory for observation and analysis. An industrial hygienist must assist with identifying the appropriately qualified laboratory for sample submission and to help with filling out the chain of custody form, as shown in **Appendix 2**. The total air volume from the air sampling record-keeping sheets is required as well as the type of analysis requested (**Appendix 3**). After the results are received from the laboratory, the analytical results must be converted to 8-hour time-weighted averages or other measures so the results can be compared to standards published by the Indian Standards, American Board of Industrial Hygiene (ABIH), OSHA, NIOSH, etc. Interpretation of results must be done in consultation with an industrial hygienist and the activities at the time of sample collection must be correlated with the results.

Based on the above overview of the sampling process, several online sessions were held with Karen Gunderson to strengthen the understanding and knowledge. The following template was used for the air samples collected on the sampler donated (**Appendix 3**). **A detailed process of sample collection (step-wise) has been attached as Appendix 4.**

Table 1- The index was used to fill in the information for sample analysis

Code: SOP-T-08.F01a

ANALYSIS REQUEST FORM	Version: 01
	Page 1/2
	Effective date:
	ENVIRONICS TRUST, INDIA - ASBESTOS SAMPLES
	DATE -
	KAREN GUNDERSON/ POOJA GUPTA

Sample Number	Analysis request	Description of the sample	Pump No.	Flow (ml/min)	RD before/ after (%)	Start (hh:mm)	Stop (hh:mm)	Time (min)	Volume (m ³)	T (°C)

With the help of Karen Gunderson and other DWOI members, the analysis was performed pro-bono by Steven Verpaele, MSc, Occupational/Industrial Hygienist and President- BeCOHvzw, Belgium.

OBSERVATION

Asbestos analysis by SEM following ISO 10312 in high vacuum was used to do the analysis by Dr. Rieko Adriaens. 23 community sampling, 1 portable sampling, and 5 blank samples were tested. The detection limit as per NIOSH 7402 was < 0.01 fibers per cc; this was confirmed by the lab after the analysis report was submitted. EDX characterization was performed on fiber structures or other particles if no fiber structures could be identified. As per the reports received, none of the samples showed any detectable trace of asbestos particles as per NIOSH 7402. However, all samples did show asbestos fibres below this concentration. Several samples contain a rare fibrous structure, but the fiber morphology and chemical EDX characterization show these are not asbestos fibers. SEM-images with a secondary electron detector of the sample on some samples show a network of the PVC filter using different magnifications with **several multiple particles on the surface** though no fiber structures were observed (**Appendix 5 for detailed lab report**).

PROBLEMS IN SAMPLING

The lack of positive reports cannot be taken into consideration because of three major factors-

1. The samples were stranded for more than 14 months (Sample Collection – February 2020, Sample Analysis April 2021) due to the COVID-19 pandemic. This may have led to sample disassociation from the substrate for some unknown reason.
2. The samples may have been jolted during transportation from field to laboratory.

3. There may have been leaks in the sampling cassettes
4. Atmospheric conditions could have affected the ability of the samplers to collect the fibers.
5. Most likely, the flow rate of the personal samplers was not sufficient to do community (environmental)-based testing, as the volume of sample collected was too small. Environmental/ambient samples usually use a high flow pump and in this case personal (low flow) pumps were used. It was hoped some factory workers might be recruited to wear the personal air sampling pumps, but they were used in the community setting instead.

WAY FORWARD

Kymore is the oldest asbestos cement factory in India and several hundred cases of asbestos disorders have been diagnosed. The absence of a positive result cannot be considered a vindication of asbestos free air in the area. Surface contamination is clearly visible in the area and have been acknowledged in previous studies.

It is important to identify the reason for majority of negative results as an air sampling done in a prime location (around an asbestos using industry) is questionable. As clarified by the lab, samples had presence of asbestos fibres, but they were below reportable limit of 0.01 f/cc. A fresh sampling protocol needs to be done with higher flow pumps, which will provide more precision with the least error value, to confirm the result. The loophole once identified (sampling error, lab error, or equipment error) can be helpful in future sampling.

Another option would be to collect surface or wipe samples to confirm the presence of airborne asbestos fibers that have settled around the community. While there are not set "safe" standards for surface samples, they will be indicative of the extent of settled airborne fibers in areas around the factory.

There is a need for a periodic and seasonal sampling in Kymore especially pre-monsoon or during peak summer season as the conditions may be ripe for asbestos fibres to become air-borne during that period.

A reliable and cheap hygiene lab located in India or closer need to be identified where samples can be sent quickly for analysis to remove any errors due to transportation and time lag. This will be helpful in replicating similar exercises in other communities located asbestos manufacturing or mining areas.

PHOTOS



Figure 3- Entry to the town



Figure 4 - Calibrating the pump before sampling



Figure 5- Device placed on the hight for sampling



Figure 6- Putting the sampler nearby an entry gate



Figure 7- Donated New Model of pump used for collection



Figure 8 - Old Model placed on the window of a house



Figure 9- New model placed on a window



Figure 10- Marking the location and Time during sampling



Figure 11- Marking field blank before sampling



Figure 12 – A secondary exposed victim sharing her story and reports while sampler was attached to her rooftop.



Figure 13 -After explaining the process and reason of community sampling



Figure 14 -Meeting before sampling

Appendix 1

Sample No	Date	Run Time (in Minutes)	Site Name	Reason for selection	Environment conditions at time of selection	Coordinates	
1	18.02.2020	250	Wore by the Volunteer.	To trace the usual movement across the town	Roads, Houses, grounds were crossed. Dry and Hot	24'03.448	80.36.623
2	18.02.2020	476	AT WINDOW - Vijay Lal	3 victims in one family. House was on the outside of the town. So to check the exposure intensity	Dry and Hot. Wind direction was towards the selected site. Location was disant from the factory and central muck dump	24'03.063	80.35.475
3	18.02.2020	463	AT WINDOW - Rajesh Dube	Worker's House, It had a victim (primary)	Dry and Hot.	24'02.697	80'37.976
4	19.02.2020	438	AT WINDOW - Manoj Naidu	Worker's House, It had a victim (primary)	Dry and Hot.	24'03.506	80.36.634
5	19.02.2020	501	AT WINDOW - Pradyum Singh	Worker's House, It had a victim (primary)	Dry and Hot.	24'03.029	80.35.848
6	19.02.2020	456	AT WINDOW - Jameel Ahamad	Worker's House, It had a victim (primary). It has small	Dry and Hot.	24'02.775	80.36.006
7	19.02.2020	441	AT WINDOW - Ghanshyam Raikvar	Worker's House, It had a victim (primary). It had a Masjid nearby, leading to greater influx of people.	Dry and Hot.	24'02.912	80.36.010
8	19.02.2020	434	AT WINDOW - Vijay Lal	3 victims in one family. House was on the outside of the town. So to check the exposure intensity	Dry and Hot.	24'03.063	80.35.475
9	19.02.2020	489	AT WINDOW - Shyam Tiwari	Central location for the locality. Medical camps are mostly organised here, bringing hundreds of workers and victims in one place. About 500 meter from the plant.	Dry and Hot.	24'02.814	80.36.319
10	20.02.20	317	AT WINDOW - Peer Mohamd	Suggested By locals	Dry and Hot.	24'02.781	80'36.007
11	20.02.20	719	AT WINDOW - Premlal	Pocket of houses. Church was nearby	Dry and Hot.	24'02.813	80'36.319
12	20.02.20	377	AT WINDOW - Vijay Lal	3 victims in one family. House was on the outside of the town. So to check the exposure intensity	Dry and Hot.	24'03.048	80'35.971
13	20.02.20	550	AT WINDOW - Omkar Prasad Namdev	Backside of the Everest Industries	Dry and Hot.	24'03.066	80'36.280
14	20.02.20	495	AT WINDOW - Alfred	Suggested By locals, Victim himself and the locality was little separate with several workers living there	Dry and Hot.	24'02.738	80.36.080
15	20.02.20	626	AT WINDOW - Shyam Tiwari	Central location for the locality. Medical camps are mostly organised here, bringing hundreds of workers and victims in one place. About 500 meter from the plant.	Dry and Hot.	24'02.814	80'36.319
16	20.02.20	498	AT WINDOW - Shekh Hakeem	Suggested By locals	Dry and Hot.	24'02.857	80'36.030
17	21.02.20	247	AT WINDOW - Omkar P Namdev	Backside of the Everest Industries	Dry and Hot.	24'03.066	80'36.280
18	21.02.20	479	Wore by the Volunteer.	To trace the usual movement across the town	Dry and Hot.	24'03.480	80'56.607
19	21.02.20	275	AT WINDOW - Ravi Dubey	It had a Masjid nearby, leading to greater influx of people. This was nearby Ghanshyam Raikvar's house	Dry and Hot.	24'02.915	80'36.016

				(No.7)			
20	21.02.20	213	AT WINDOW - Premlal Raikwar	Pocket of houses. Church was nearby	Dry and Hot. Little dusty	24'02.813	80'36.319
21	21.02.20	280	AT WINDOW - Tansen Rao	Suggested By locals	Dry and Hot.	24'03.033	80'35.801
22	21.02.20	442	AT WINDOW - Jagdish	Suggested By locals	Dry and Hot.	24'02.756	80'36.110
23	21.02.20	430	AT WINDOW - Jameer Ahmad	Suggested By locals	Dry and Hot.	24'02.173	80'35.988
24	22.02.2020	430	AT WINDOW - Ravi Dubey	It had a Masjid nearby, leading to greater influx of people. This was nearby Ghanshyam Raikvar's house (No.7)	Dry and Hot.	24'02.915	80'36.016
25	22.02.2020	244	AT WINDOW - Shyam Tiwari	Central location for the locality. Medical camps are mostly organised here, bringing hundreds of workers and victims in one place. About 500 meter from the plant.	Dry and Hot.	24'02.814	80'36.319
26	22.02.2020	220	AT WINDOW - Shyam Tiwari	Central location for the locality. Medical camps are mostly organised here, bringing hundreds of workers and victims in one place. About 500 meter from the plant.	Dry and Hot.	24'02.814	80'36.319
27	22.02.2020	414	AT OUTER WINDOW - Vijay Lal	3 victims in one family. House was on the outside of the town. So to check the exposure intensity.	Dry and Hot. Wind flow was minimal	24'03.048	80'35.971
28	22.02.2020	430	AT GATEWAY - Omkar Prasad Namdev	Backside of the Everest Industries	Dusty, Dry and Hot	24'03.066	80'36.280
29	22.02.2020	429	AT GATEWAY - Ghanshyam Raikvar	On the corner of the colony. It was requested by them	Dry and Hot. About 1km from the plant	24'02.912	80.36.010

Air Sampling Field Data Sheet

Form Prepared by: _____	Sampling Date: _____
Sampler Type _____	Identification _____
Location _____	Shift (circle) DAY SWING NIGHT

Sample Collection Data

Sample # _____ Temperature _____ (C)

Pump # _____

Flow - INITIAL (3 readings) _____ initial avg _____ L/min

Flow - FINAL (3 readings) _____ final avg _____ L/min

Average of initial and final flow rates (overall average flow rate) _____ L/min

Pump Start Time (on clock or watch) _____

Pump Stop Time (on clock or watch) _____

Total Elapsed Time _____ (min)

After sampling is complete, record total run time from pump display here: _____ minutes
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Total Air Volume Calculation

<input type="text"/>	×	<input type="text"/>	=	<input type="text"/>
Average flow (L/min)		Total elapsed time (minutes)		Total Air Volume (L)

Notes: _____ _____ _____ _____ _____ _____ _____
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Appendix 3

		ANALYSIS REQUEST FORM				Code: SOP-T-08.F01a	
						Version: 01	
						Page 1/2	
						Effective date: 2020/08/05	
				ENVIRONICS TRUST, INDIA - ASBESTOS SAMPLES			
		N° Dossier		8/5/2020			
		Date					
		Reference		KAREN GUNDERSON/ POOJA GUPTA			
		Mail address contact person		gunder5.net / poojagupta0202@gmail.com			
Lab number	Sample Number	Analysis request	Description of the sample	Pump N°	Flow (ml/min)	RD before/ after (%)	Start (hh:mm)
1	2020N-1 (Portable Day S	Asbestos PCM	lunteer. Usual Movement across the co	N-1	1994	---	3:30:00 PM
2	18.02.2020O-1	Asbestos PCM	AT WINDOW- Vijaylal	O-1	2006		11:35:00 AM
3	18.02.2020O-2	Asbestos PCM	AT WINDOW - Rajesh Dube	O-2	2035		4:02:00 PM
4	19.02.2020O-1	Asbestos PCM	AT WINDOW - Manoj Naidu	O-1	2009		
5	19.02.2020O-4	Asbestos PCM	AT WINDOW - Pradyum Singh	O-2	2002		11:12:00 AM
6	19.02.2020O-5	Asbestos PCM	AT WINDOW - Jameel Ahamad	O-5	2029		11:45:00 AM
7	19.02.2020O-3	Asbestos PCM	AT WINDOW - Ghanshyam Raikvar	O-3	2008		12:05:00 PM
8	19.02.2020N-1	Asbestos PCM	AT WINDOW - Vijaylal2	N-1	1995		12:31:00 PM
9	19.02.2020N-2	Asbestos PCM	AT WINDOW - Shyam Tiwari	N-2	1999		10:54:00 AM
10	20.02.2020O-1	Asbestos PCM	AT WINDOW - Peer Mohamd	O-1	2007		12:46:00 PM

Appendix 4

Methodology

CHARGING PUMPS

- Sampling pump had to be fully charged prior to collecting a new sample. Charging required up to 8 hours or more, so the pumps were charged as soon as possible after the day's samples were collected.
- To charge the pump, SKC pumps were put on charging station using an adaptor.

LABELING SAMPLING CASSETTE

- Each sample cassette was labelled for unique identification with descriptive sample name, reflecting the sampling event as much as possible.
- Each sample name begins with an allotted machine number and the date on which the sample was collected,
- Recorded the "Air Sampling Field Data Sheet" for the sampling period.

CALIBRATING PUMPS PRIOR TO TAKING AIR SAMPLES

- Air sampling pump were set up for collecting samples:
 - Connected the open end of the tubing to the clear plastic fitting on the pump.
 - Attached calibration sample cassette (marked 'CAL') to the fitting end of the tubing
- Turned on Flow Meter and wait 30 seconds for readings to stabilize.
- Turned on the air sampling pump and checked the reading on the flow meter. Adjusted the flow rate on the sampling pump to as close at 2.0 Liters/minute using a small flat-head screw driver.
- Once the flow rate was set as desired, the pump was run for about 3 -5 minutes to stabilize. Then the flow meter was checked three different times and the reading seen each time on the display on the Field Sampling Data Sheet was marked as "INITIAL".
- The pump was turned 'OFF' to clear any recorded time.
- Later once the sampling process was started the time was noted/marked.
- The stop time was recorded after the sampling for total run time.

CALCULATIONS - AIR SAMPLING FIELD DATA SHEET

- The Overall Average Flow Rate on the Field Data Sheet was calculated by:
 - a) Taking the average of the Initial Flow Rate readings (first three flow meter readings) from the result in the "initial average".
 - b) Take the average of the Final Flow Rate Readings (last three flow meter readings). Add them up and divide by three. Put the result in the "final average".
 - c) Find the overall average flow by taking the average of the average initial and final flow rates (calculated in "a" and "b"). The final result was written as the "overall average flow rate".
 - Calculate the Total Elapsed time by:

Calculating the difference between the Pump Start and Stop Time calculated the total run time (in minutes).
1. Calculate the Total Air Volume by:
 - a) Filling in the Average Flow Rate (L/min) and the Total Elapsed Time (minutes) the total volume of the sample was calculated. Multiplying them together and writing the result as Total Air Volume (L). That is the air volume collected for that particular sample and was reported on the spreadsheet submitted to the lab for the sample analysis as shown in (Appendix 3).

RECORDKEEPING

1. All the Field Data Sheets were kept in a safe place in a file or folder for reference and identification on the community sampling location. The records are critical to the validity of the samples.

2. The samples were tightly sealed and were kept in a safe and clean bag. The bags were avoided from jostling.
Note - Due to pandemic the sample were stuck for more than a year as the international freights were closed and the parcel to Belgium was restricted.

SAMPLE SUBMISSION

The samples we sent to Belgium for analysis. With the help of Karen Gunderson, the analysis was donated by Steven Verpaele, MSc, Occupational/Industrial Hygienist and President- BeCOHvzw, Belgium.

Appendix 5



ANALYSIS REPORT

October 4, 2021

Your Reference: WHWB- DWOI samples
Our Reference: W21.001

Table 1: References of the samples. Blanks are highlighted with **.

Your reference	Blank	Our reference	Analysis
21-WB001 18.02.2020N-1		2103BR01	Asbestos analysis by SEM following ISO 10312
21-WB002 18.02.2020O-1		2103BR02	Asbestos analysis by SEM following ISO 10312
21-WB003 18.02.2020O-2		2103BR03	Asbestos analysis by SEM following ISO 10312
21-WB004 19.02.2020O-1		2103BR04	Asbestos analysis by SEM following ISO 10312
21-WB005 19.02.2020O-4		2103BR05	Asbestos analysis by SEM following ISO 10312
21-WB006 19.02.2020O-5		2103BR06	Asbestos analysis by SEM following ISO 10312
21-WB007 19.02.2020O-3		2103BR07	Asbestos analysis by SEM following ISO 10312
21-WB008 19.02.2020N-1		2103BR08	Asbestos analysis by SEM following ISO 10312
21-WB009 19.02.2020N-2		2103BR09	Asbestos analysis by SEM following ISO 10312
21-WB010 20.02.2020O-1		2103BR10	Asbestos analysis by SEM following ISO 10312
21-WB011 20.02.2020O-2		2103BR11	Asbestos analysis by SEM following ISO 10312
21-WB012 20.02.2020O-3		2103BR12	Asbestos analysis by SEM following ISO 10312
21-WB013 20.02.2020O-4		2103BR13	Asbestos analysis by SEM following ISO 10312
21-WB014 20.02.2020O-5		2103BR14	Asbestos analysis by SEM following ISO 10312
21-WB015 20.02.2020N-1		2103BR15	Asbestos analysis by SEM following ISO 10312
21-WB016 20.02.2020N-2		2103BR16	Asbestos analysis by SEM following ISO 10312
21-WB017 21.02.2020O-1		2103BR17	Asbestos analysis by SEM following ISO 10312
21-WB018 21.02.2020O-2		2103BR18	Asbestos analysis by SEM following ISO 10312
21-WB019 21.02.2020O-3		2103BR19	Asbestos analysis by SEM following ISO 10312
21-WB020 21.02.2020O-4		2103BR20	Asbestos analysis by SEM following ISO 10312
21-WB021 21.02.2020O-5		2103BR21	Asbestos analysis by SEM following ISO 10312
21-WB022 21.02.2020N-1		2103BR22	Asbestos analysis by SEM following ISO 10312
21-WB023 21.02.2020N-2		2103BR23	Asbestos analysis by SEM following ISO 10312
18-02-2020 Portable Day Sampling (N-1)	?	2103BR24	Asbestos analysis by SEM following ISO 10312
22-02-2020 01	?	2103BR25	Asbestos analysis by SEM following ISO 10312
22-02-2020 03	?	2103BR26	Asbestos analysis by SEM following ISO 10312
22-02-2020 (0-4)	?	2103BR27	Asbestos analysis by SEM following ISO 10312
22-02-2020 0-5	?	2103BR28	Asbestos analysis by SEM following ISO 10312
22-02-2020 (N1)	?	2103BR29	Asbestos analysis by SEM following ISO 10312

Your reference: WB21_001

Our reference: 2103BR

Your reference	Blank	Our reference	Analysis
22-02-2020 N1	?	2103BR30	Asbestos analysis by SEM following ISO 10312
18-02-2020 F Blank **	x	2103BR31	Asbestos analysis by SEM following ISO 10312
18-02-2020 F Blank (0-1) **	x	2103BR32	Asbestos analysis by SEM following ISO 10312
18-02-2020 Calibration Kymore **	x	2103BR33	Asbestos analysis by SEM following ISO 10312
FB-19-2020 Calibration Kymore **	x	2103BR34	Asbestos analysis by SEM following ISO 10312
FB-19-02-20 **	x	2103BR35	Asbestos analysis by SEM following ISO 10312
20.02.2020 FB (VIJAYLAL) **	x	2103BR36	Asbestos analysis by SEM following ISO 10312
20.02.2020 Cal Kymore**	x	2103BR37	Asbestos analysis by SEM following ISO 10312
20.02.2020 FB**	x	2103BR38	Asbestos analysis by SEM following ISO 10312
21-02-2020 Cal Kymore**	x	2103BR39	Asbestos analysis by SEM following ISO 10312
21-02-2020 FB Ravi**	x	2103BR40	Asbestos analysis by SEM following ISO 10312
22-02-2020 FB**	x	2103BR41	Asbestos analysis by SEM following ISO 10312
22-02-2020 CLALI Kymore**	x	2103BR42	Asbestos analysis by SEM following ISO 10312

Table 2: Measurement characteristics.

Electron microscope	FEI Nova Nano SEM 450 equipped with EDX spectroscopy
Operational mode	High vacuum
Sample preparation	Coated with Pt/Pd
Operator	Dr. Rieko Adriaens
Date of analysis	15/04/2021 – 15/06/2021
Amount of investigated standard areas / sample used for counting	> 10
Standard area dimensions	99.5µm x 99.5µm
Chemical characterization	EDX characterization was performed on fibre structures or on other particles if no fibre structures could be identified
Results	<ul style="list-style-type: none"> • Table 3 for counts • Figures 1-42 for SEM images • Figures 1a – 30a for SEM-EDX data. No EDX spectra were obtained from the blank samples.
Conclusion	No asbestos fibres were identified in the samples. Several samples contain a rare fibrous structure, but the fibre morphology and chemical EDX characterization shows these are not asbestos fibres.
Remarks	<ol style="list-style-type: none"> 1. Sample blank “21-02-2020 Cal Kymore” contained 2 filters + substrates in the filter cassette which were both placed in the wrong direction. 2. Samples blank “18-02-2020 F Blank” and “FB-19-2020 Calibration Kymore” contained 2 filters + substrates in the filter cassette.



Your reference: WB21_001

Our reference: 2103BR

Table 3: Results of the SEM analysis. Blank samples are indicated with **.

Your reference	Number of fibre structures counted	Number of asbestos structures counted	Structure type (Single fibre/ bundle/ cluster/ matrix)	Asbestos type (Serpentine or amphibole, or subgroup)
21-WB001 18.02.2020N-1	0	0	/	/
21-WB002 18.02.2020O-1	1	0	/	/
21-WB003 18.02.2020O-2	0	0	/	/
21-WB004 19.02.2020O-1	0	0	/	/
21-WB005 19.02.2020O-4	2	0	/	/
21-WB006 19.02.2020O-5	0	0	/	/
21-WB007 19.02.2020O-3	1	0	/	/
21-WB008 19.02.2020N-1	0	0	/	/
21-WB009 19.02.2020N-2	1	0	/	/
21-WB010 20.02.2020O-1	1	0	/	/
21-WB011 20.02.2020O-2	0	0	/	/
21-WB012 20.02.2020O-3	1	0	/	/
21-WB013 20.02.2020O-4	1	0	/	/
21-WB014 20.02.2020O-5	0	0	/	/
21-WB015 20.02.2020N-1	0	0	/	/
21-WB016 20.02.2020N-2	1	0	/	/
21-WB017 21.02.2020O-1	4	0	/	/
21-WB018 21.02.2020O-2	1	0	/	/
21-WB019 21.02.2020O-3	1	0	/	/
21-WB020 21.02.2020O-4	0	0	/	/
21-WB021 21.02.2020O-5	0	0	/	/
21-WB022 21.02.2020N-1	1	0	/	/
21-WB023 21.02.2020N-2	0	0	/	/
18-02-2020 Portable Day Sampling (N-1)	0	0	/	/
22-02-2020 01	0	0	/	/
22-02-2020 03	0	0	/	/
22-02-2020 (0-4)	0	0	/	/
22-02-2020 0-5	1	0	/	/
22-02-2020 (N1)	1	0	/	/
22-02-2020 N1	0	0	/	/
18-02-2020 F Blank **	0	0	/	/
18-02-2020 F Blank (0-1) **	0	0	/	/
18-02-2020 Calibration Kymore **	0	0	/	/
FB-19-2020 Calibration Kymore **	0	0	/	/
FB-19-02-20 **	0	0	/	/
20.02.2020 FB (VIJAYLAL) **	0	0	/	/
20.02.2020 Cal Kymore**	0	0	/	/
20.02.2020 FB**	0	0	/	/
21-02-2020 Cal Kymore**	0	0	/	/
21-02-2020 FB Ravi**	0	0	/	/
22-02-2020 FB**	0	0	/	/
22-02-2020 CLALI Kymore**	0	0	/	/

Your reference: WB21_001

Our reference: 2103BR

21-WB001 | 18.02.2020N-1

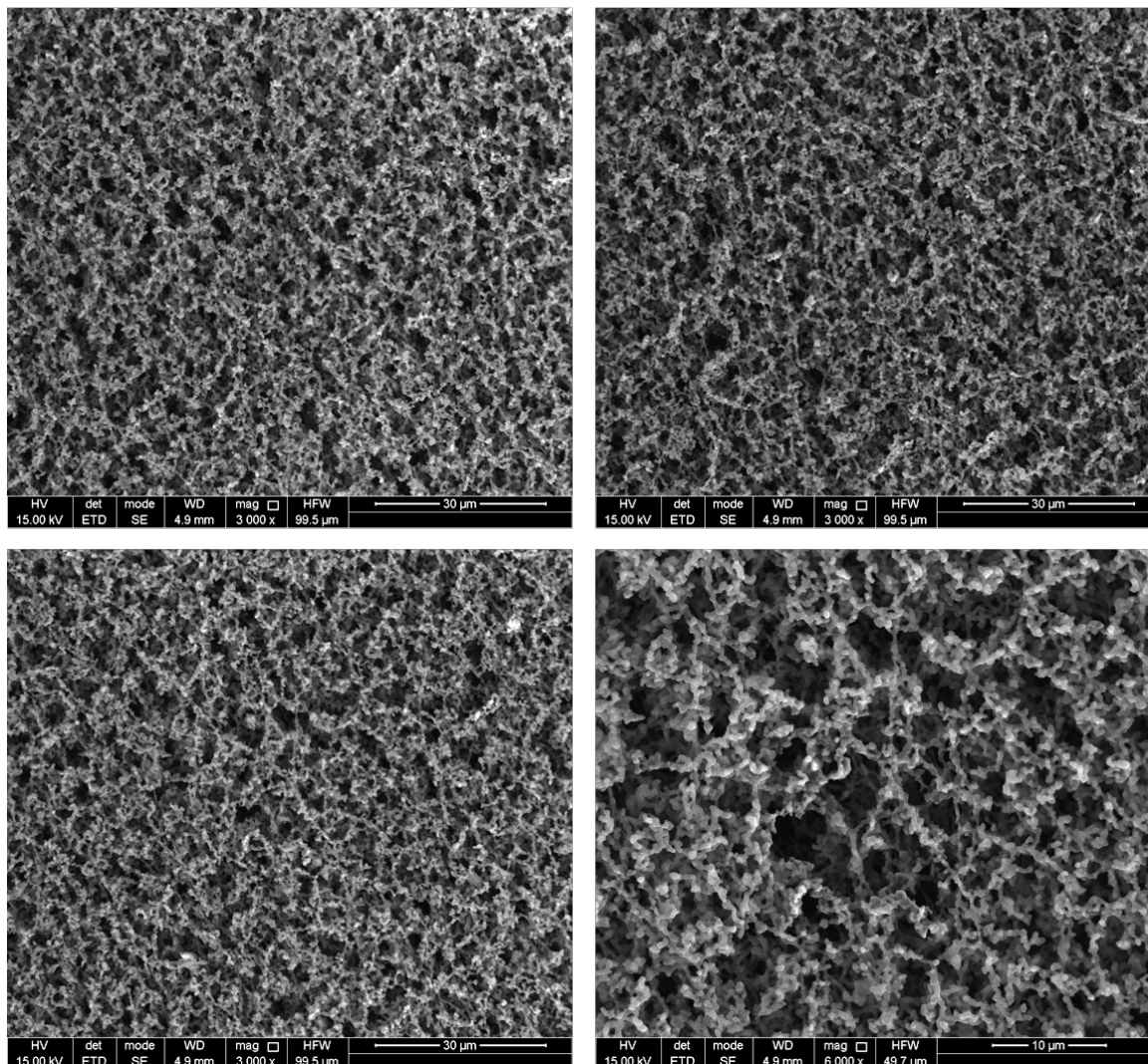


Figure 1. SEM-images with secondary electron detector of the sample “21-WB001 | 18.02.2020N-1”. The images show the network of the pvc filter using different magnifications. No fibre structures or other particles were observed in this sample.

Your reference: WB21_001

Our reference: 2103BR

21-WB002 | 18.02.20200-1

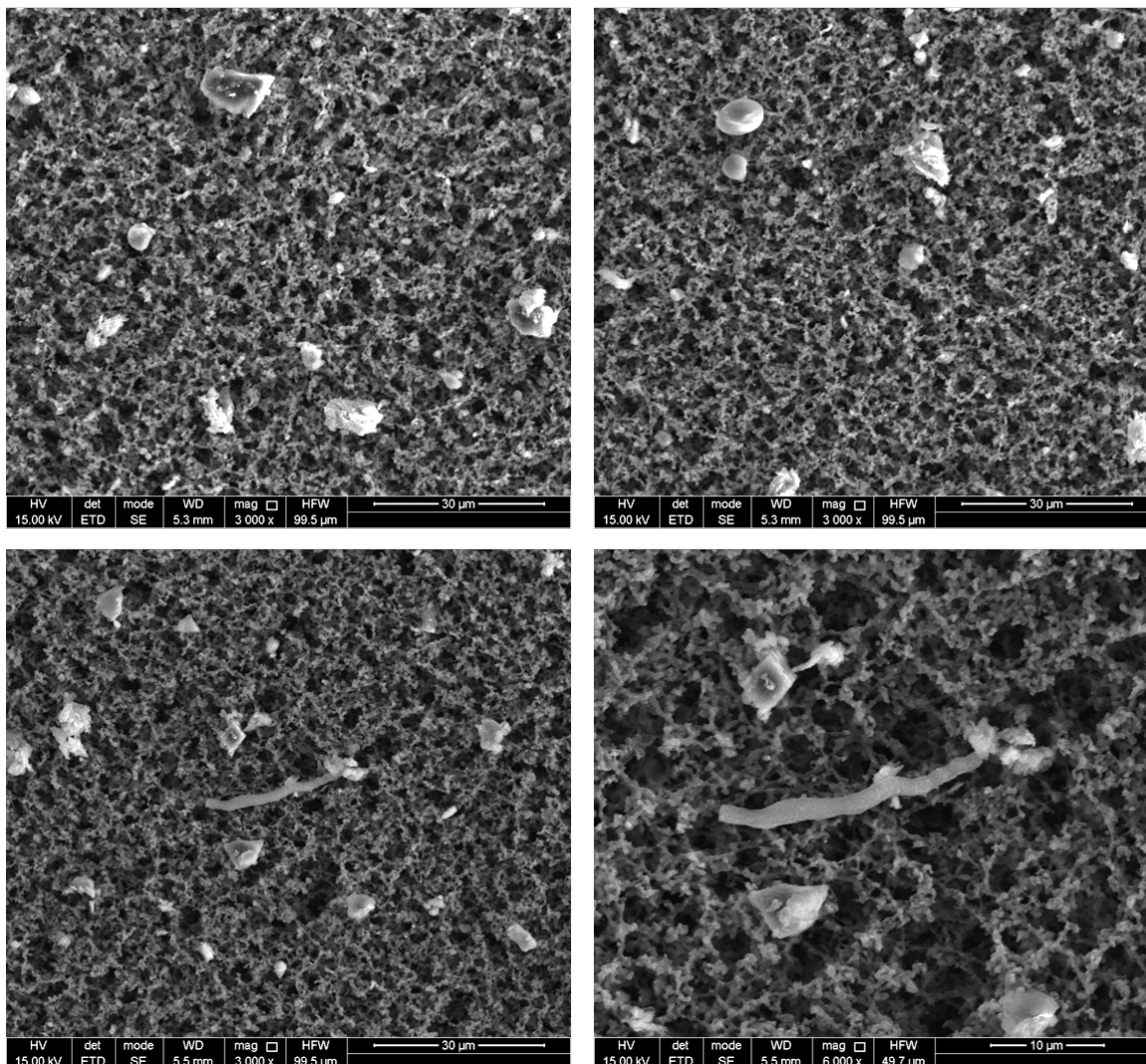


Figure 2. SEM-images with secondary electron detector of the sample “21-WB002 | 18.02.20200-1”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. One single fibre structure was observed in this sample but it has no asbestos appearance. The chemical characterization confirms it is not an asbestos fibre (see Figure 2a).

Your reference: WB21_001
Our reference: 2103BR

21-WB002 | 18.02.2020-1

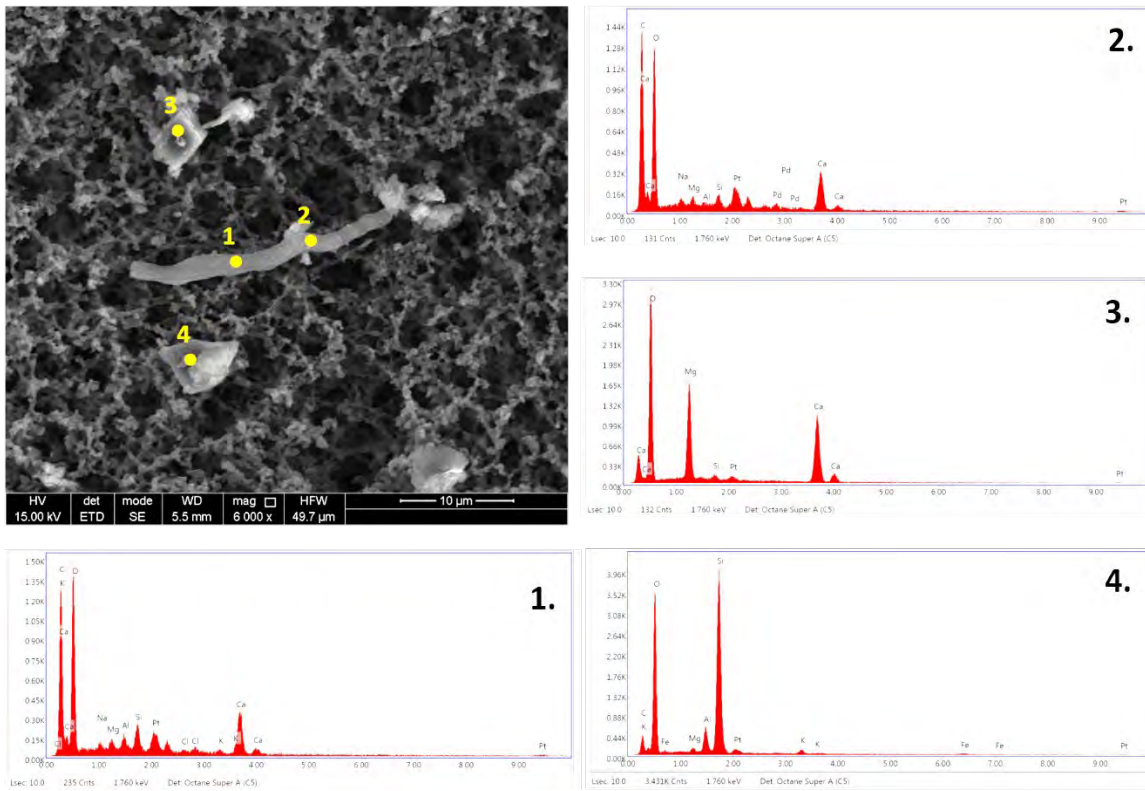


Figure 2a. EDX characterization of the particles identified in sample “21-WB002 | 18.02.2020-1”. The chemical composition of the fibre structure (spots “1” and “2”) consists of mainly carbon, oxygen and calcium.

Your reference: WB21_001
Our reference: 2103BR

21-WB003 | 18.02.20200-2

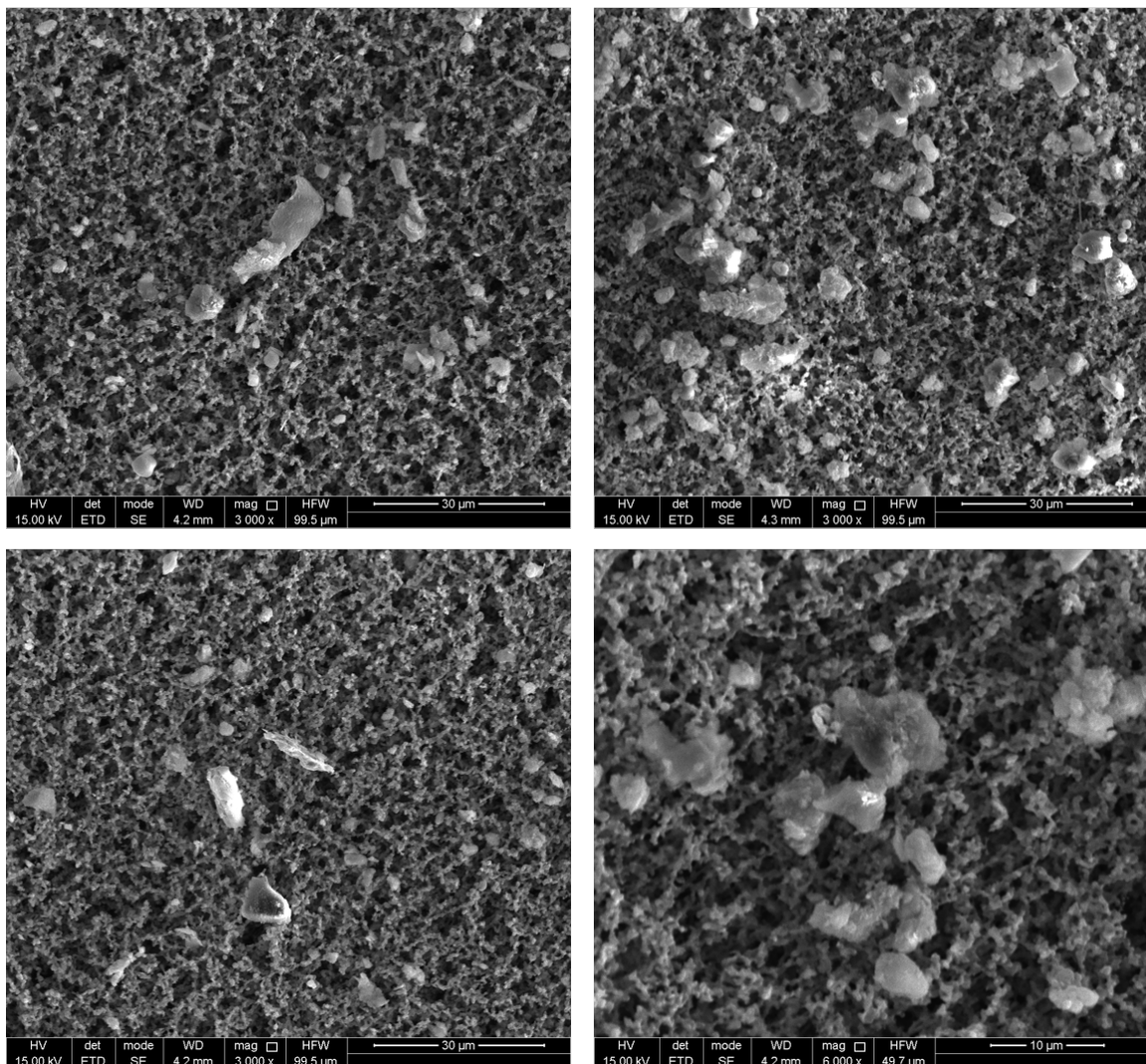


Figure 3. SEM-images with secondary electron detector of the sample “21-WB003 | 18.02.20200-2”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. No fibre structures were observed. The chemical characterization of the particles is shown in Figure 3a.

Your reference: WB21_001
 Our reference: 2103BR

21-WB003 | 18.02.20200-2

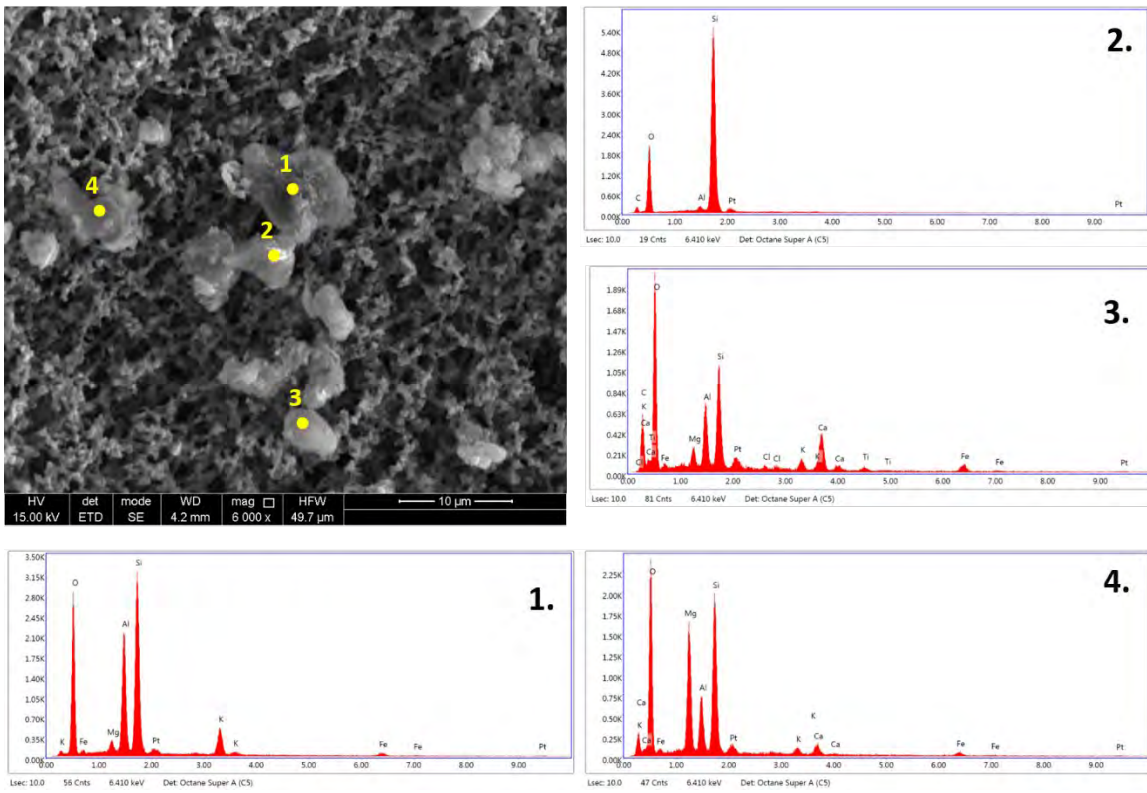


Figure 3a. EDX characterization of the particles identified in sample “21-WB003 | 18.02.20200-2”.

Your reference: WB21_001

Our reference: 2103BR

21-WB004 | 19.02.2020O-1

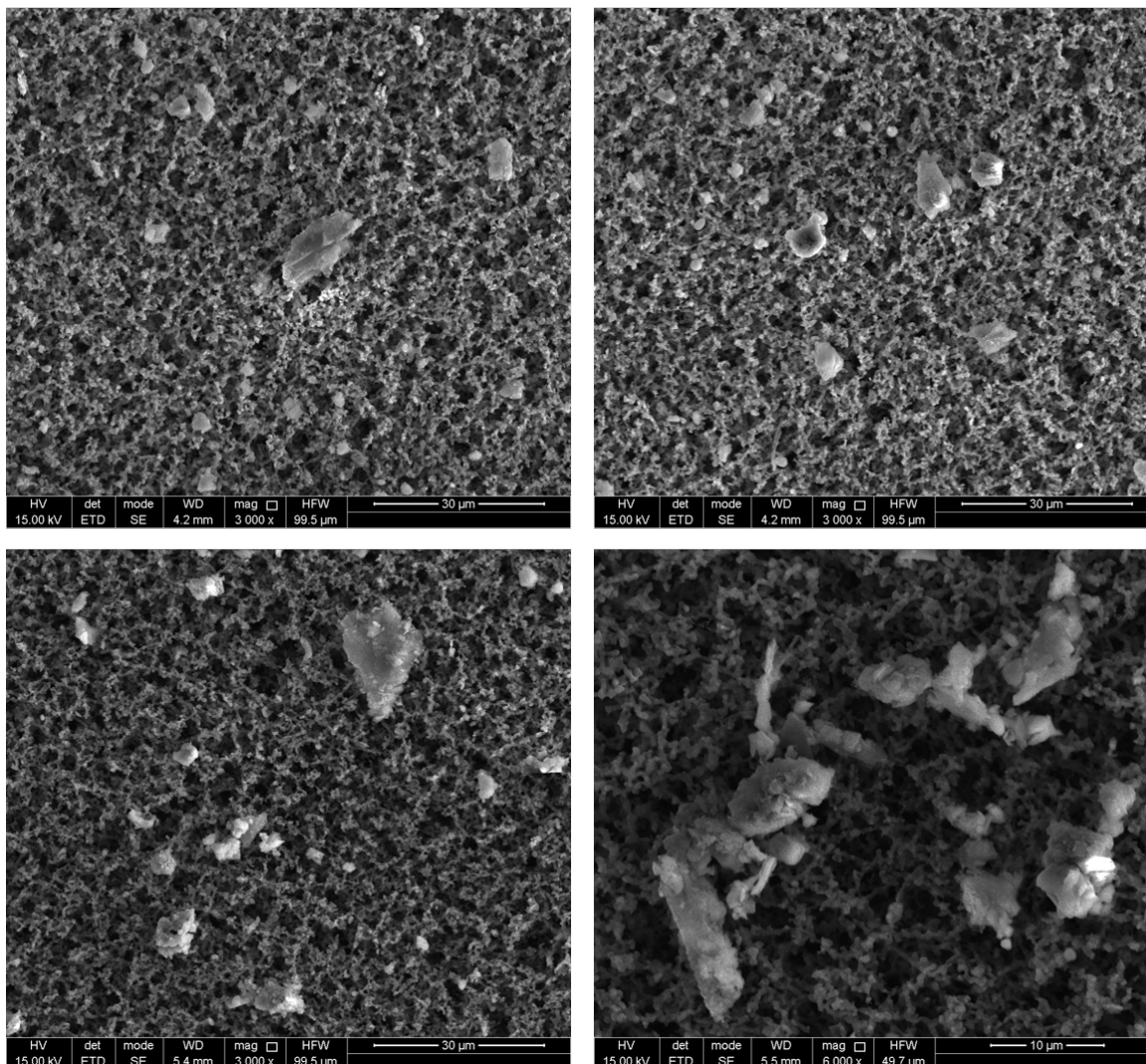


Figure 4. SEM-images with secondary electron detector of the sample “21-WB004 | 19.02.2020O-1”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. No fibre structures were observed. The chemical characterization of the particles is shown in Figure 4a.

Your reference: WB21_001
 Our reference: 2103BR

21-WB004 | 19.02.2020-1

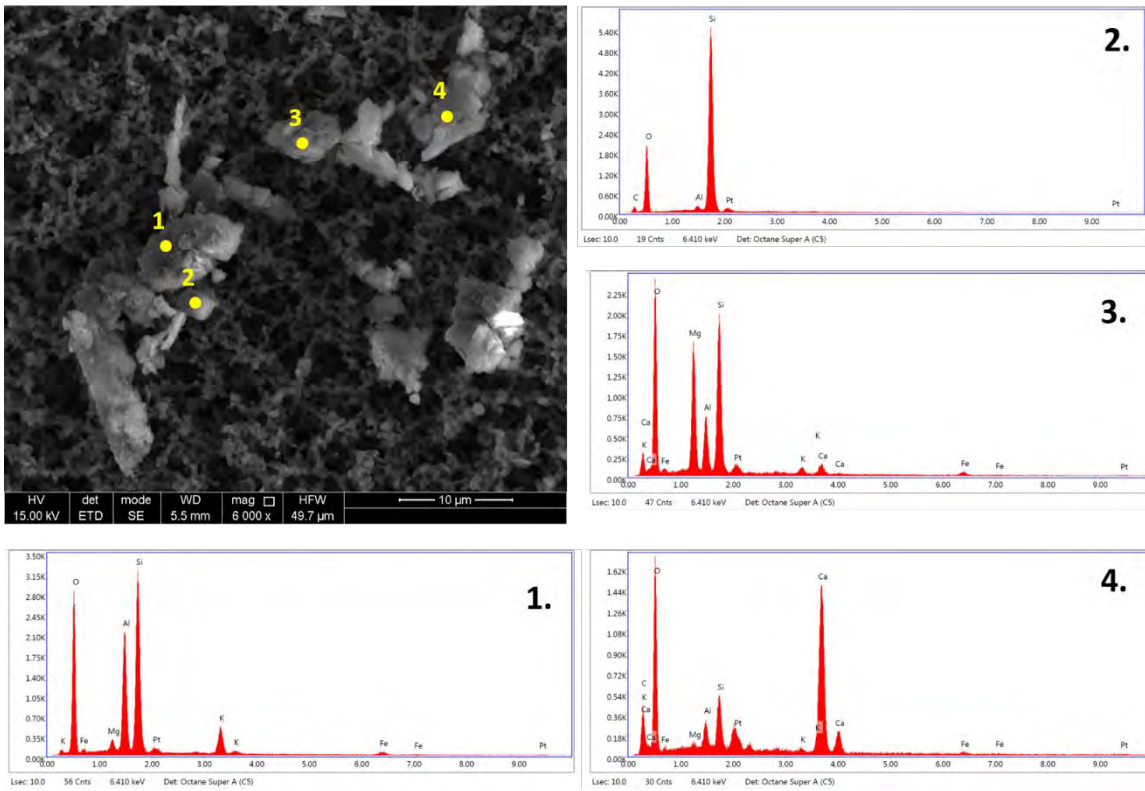


Figure 4a. EDX characterization of the particles identified in sample “21-WB004 | 19.02.2020-1”.

Your reference: WB21_001
Our reference: 2103BR

21-WB005 | 19.02.2020O-4

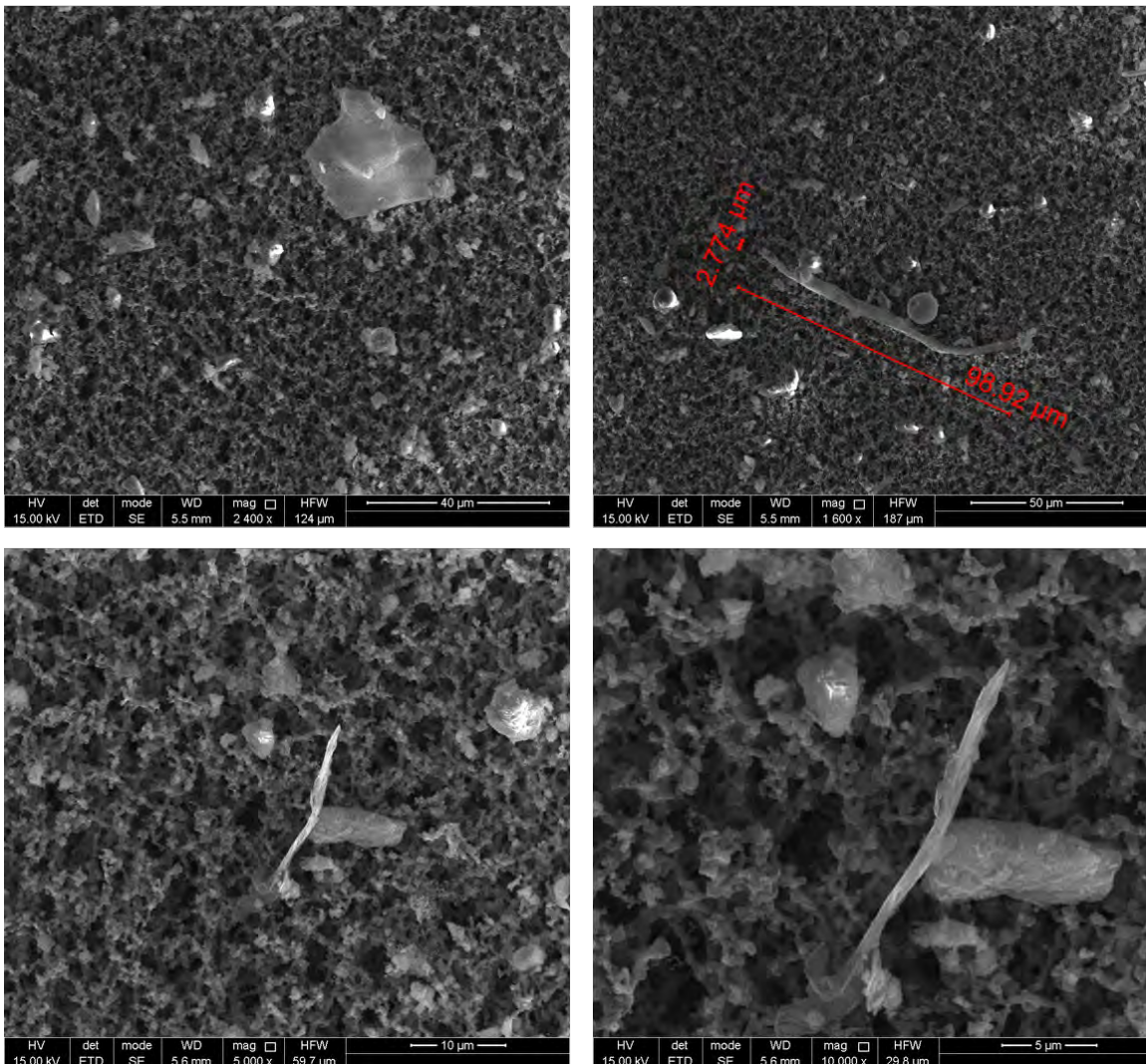


Figure 5. SEM-images with secondary electron detector of the sample “21-WB005 | 19.02.2020O-4”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. Two single fibre structures were observed in this sample but the fibres have no asbestos appearance. The chemical characterization confirms that they are not asbestos fibres (see Figure 5a).

Your reference: WB21_001
Our reference: 2103BR

21-WB005 | 19.02.20200-4

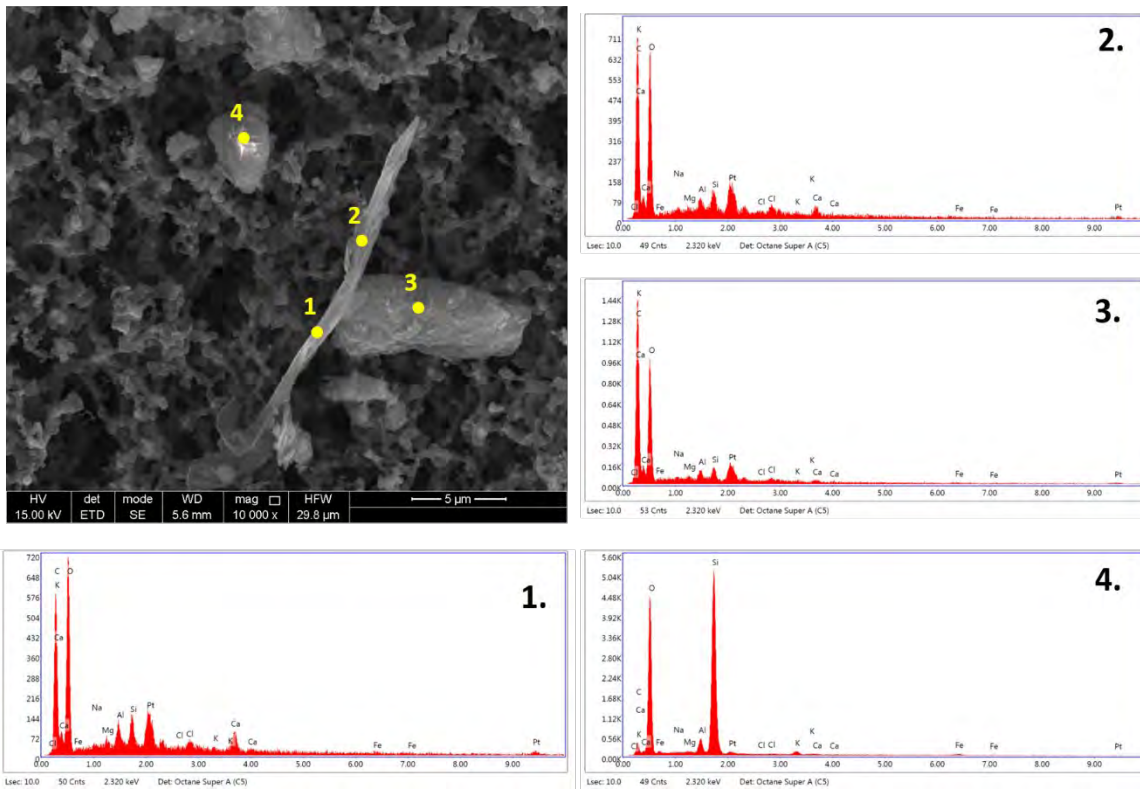


Figure 5a. EDX characterization of the particles identified in sample “21-WB005 | 19.02.20200-4”. The chemical composition of the fibre structure (spots “1” and “2”) consists of mainly carbon and oxygen.

Your reference: WB21_001

Our reference: 2103BR

21-WB006 | 19.02.2020O-5

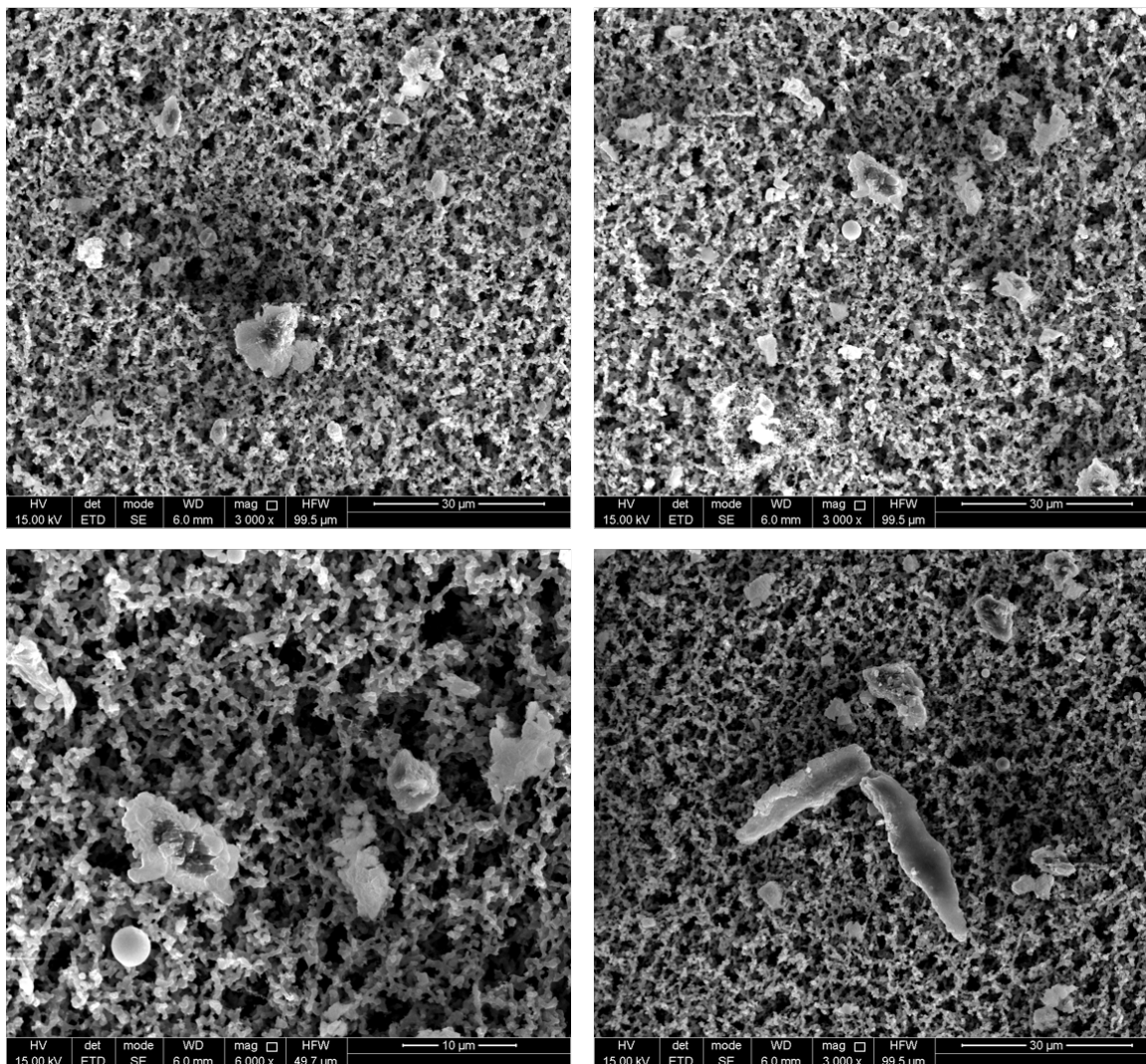


Figure 6. SEM-images with secondary electron detector of the sample “21-WB006 | 19.02.2020O-5”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. The chemical characterization of the particles is shown in Figure 6a.

Your reference: WB21_001
 Our reference: 2103BR

21-WB006 | 19.02.20200-5

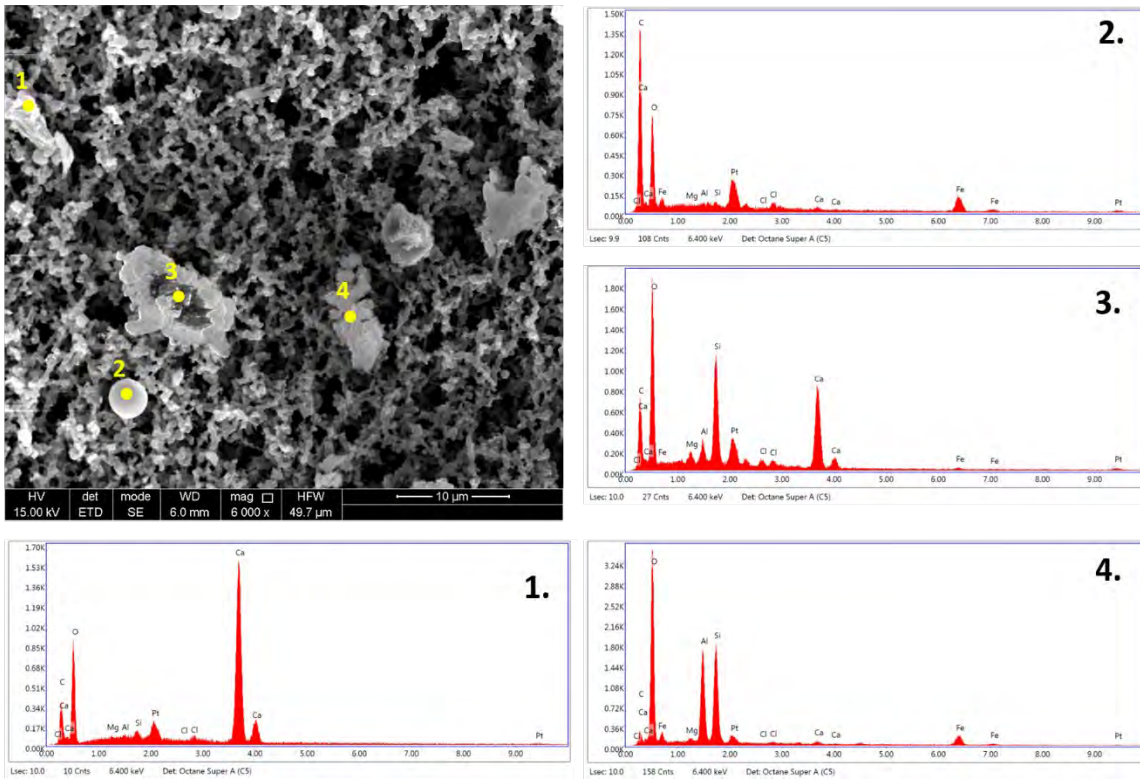


Figure 6a. EDX characterization of the particles identified in sample “21-WB006 | 19.02.20200-5”.

Your reference: WB21_001

Our reference: 2103BR

21-WB007 | 19.02.2020O-3

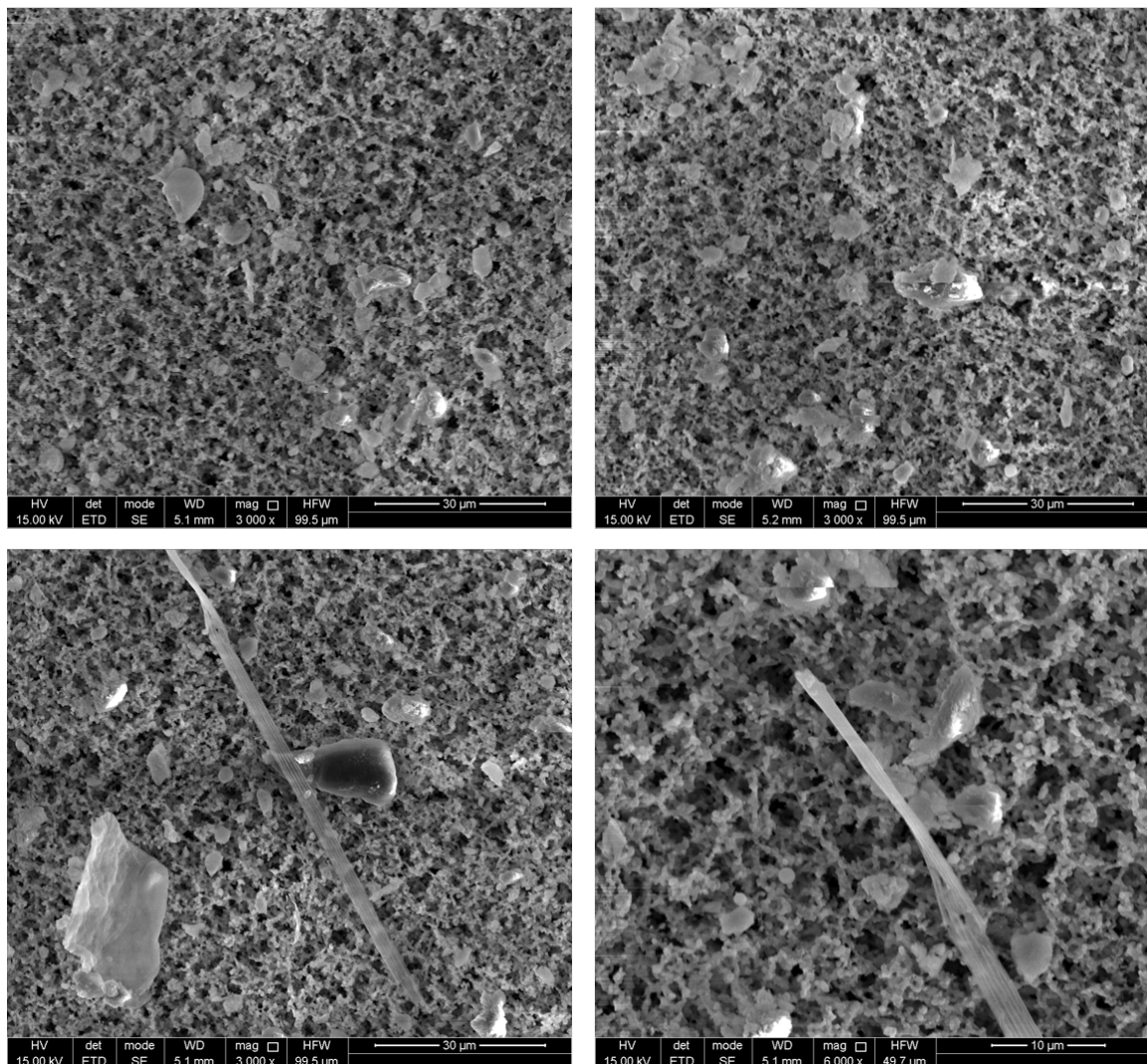


Figure 7. SEM-images with secondary electron detector of the sample “21-WB007 | 19.02.2020O-3”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. Two single fibre structures were observed in this sample but the fibres have no asbestos appearance. The chemical characterization confirms that they are not asbestos fibres (see Figure 7a).

Your reference: WB21_001
Our reference: 2103BR

21-WB007 | 19.02.20200-3

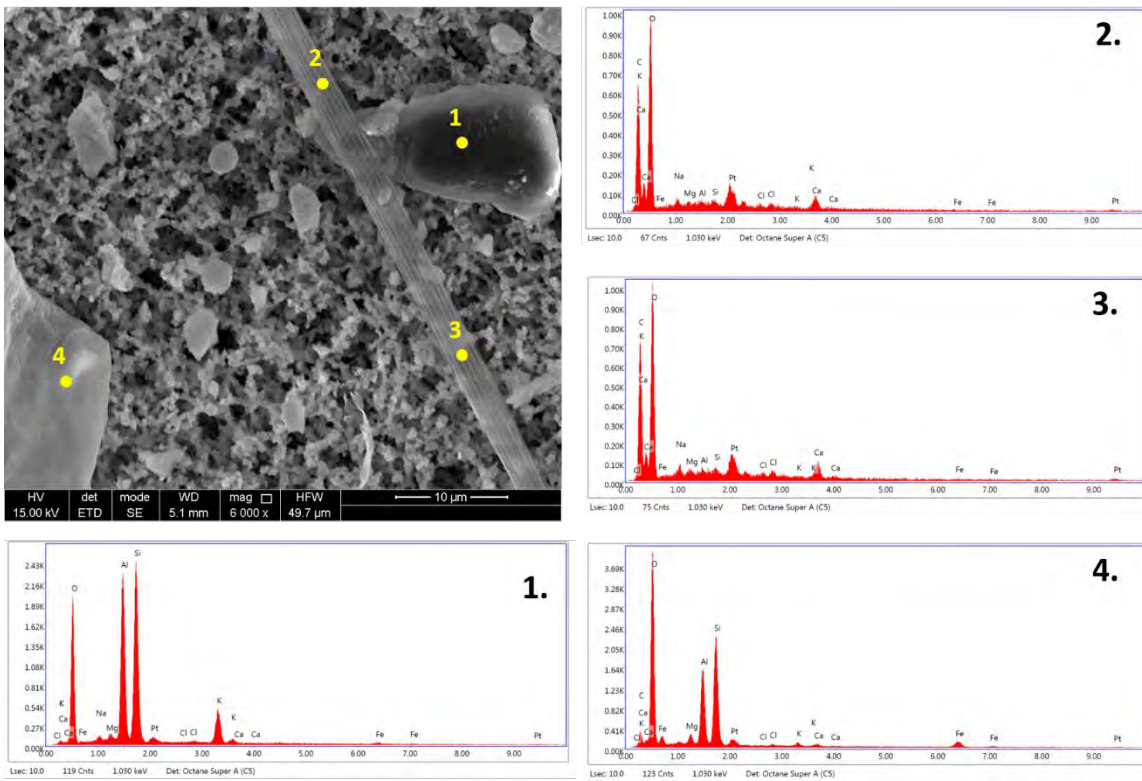


Figure 7a. EDX characterization of the particles identified in sample “21-WB007 | 19.02.20200-3”. The chemical composition of the fibre structure (spots “2” and “3”) consists of mainly carbon and oxygen.

Your reference: WB21_001
Our reference: 2103BR

21-WB008 | 19.02.2020N-1

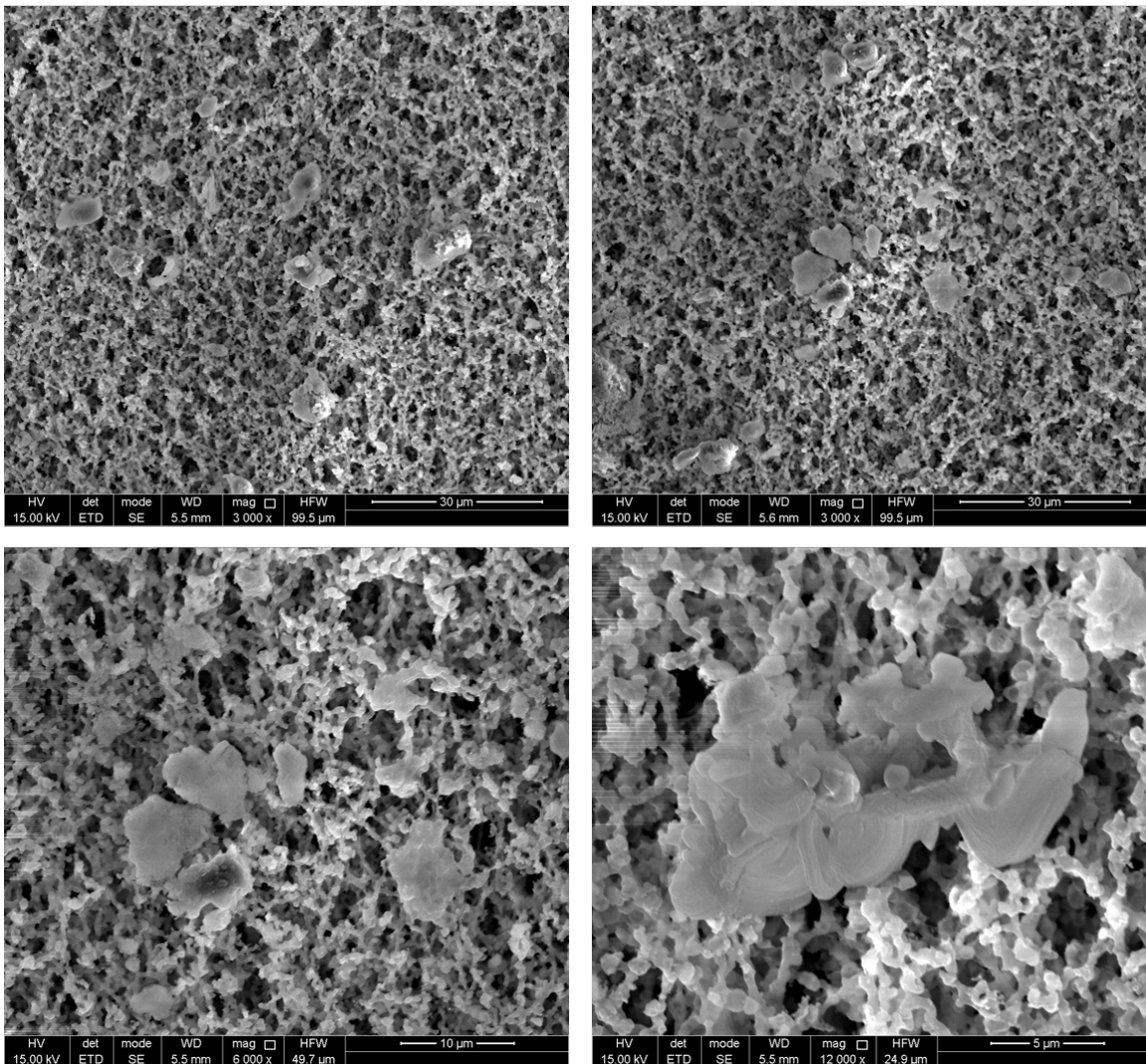


Figure 8. SEM-images with secondary electron detector of the sample “21-WB008 | 19.02.2020N-1”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. The chemical characterization of the particles is shown in Figure 8a.

Your reference: WB21_001

Our reference: 2103BR

21-WB008 | 19.02.2020N-1

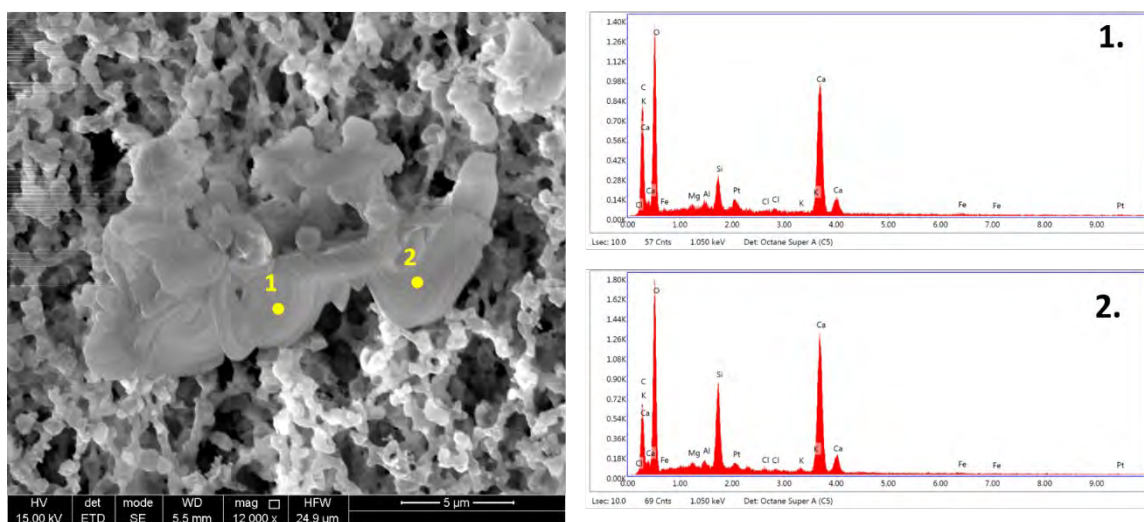


Figure 8a. EDX characterization of the particles identified in sample “21-WB008 | 19.02.2020N-1”.

Your reference: WB21_001

Our reference: 2103BR

21-WB009 | 19.02.2020N-2

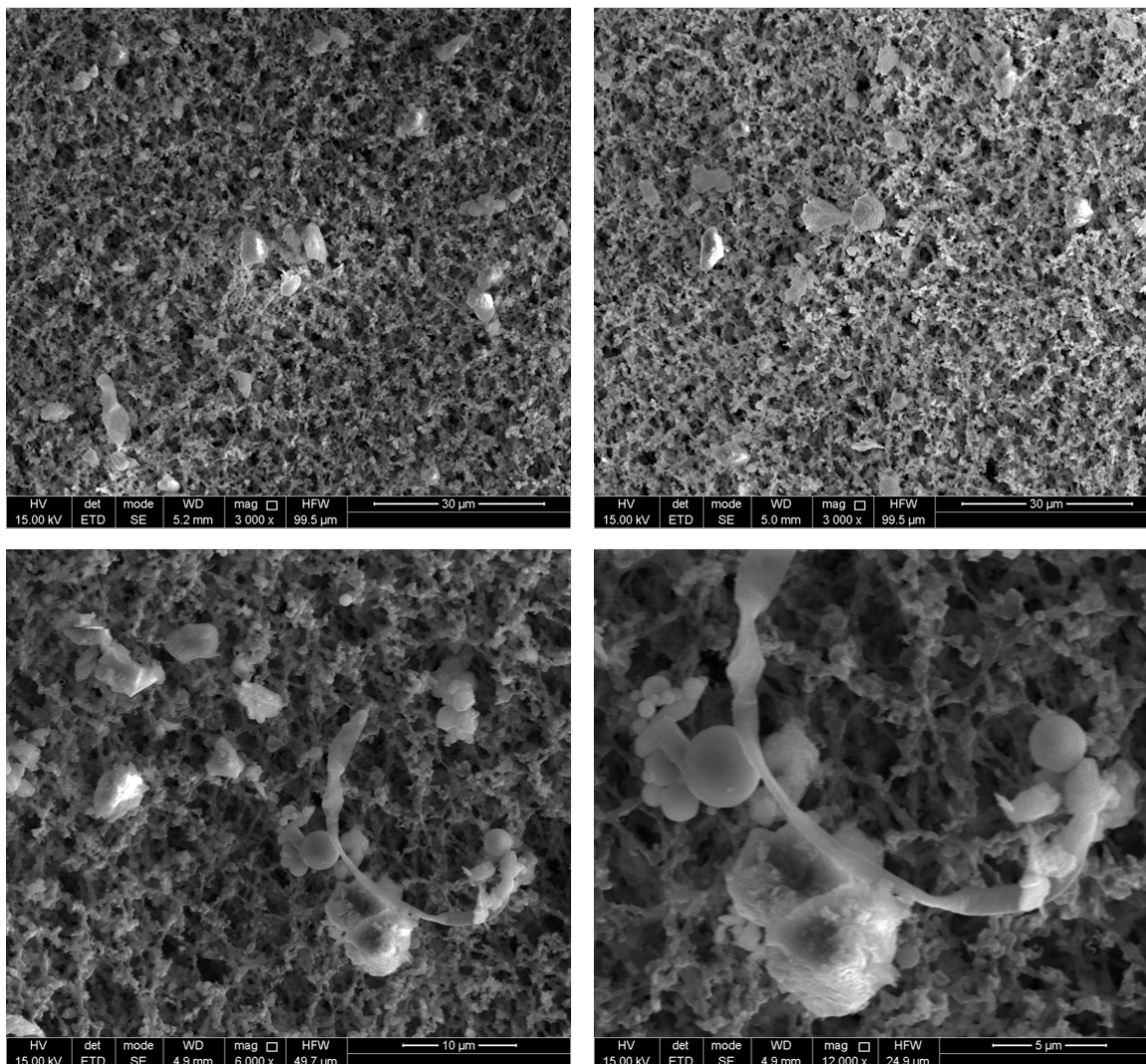


Figure 9. SEM-images with secondary electron detector of the sample “21-WB009 | 19.02.2020N-2”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. One single fibre structure was observed in this sample but the fibre has no asbestos appearance. The chemical characterization confirms that it is not an asbestos fibre (see Figure 9a).

Your reference: WB21_001
 Our reference: 2103BR

21-WB009 | 19.02.2020N-2

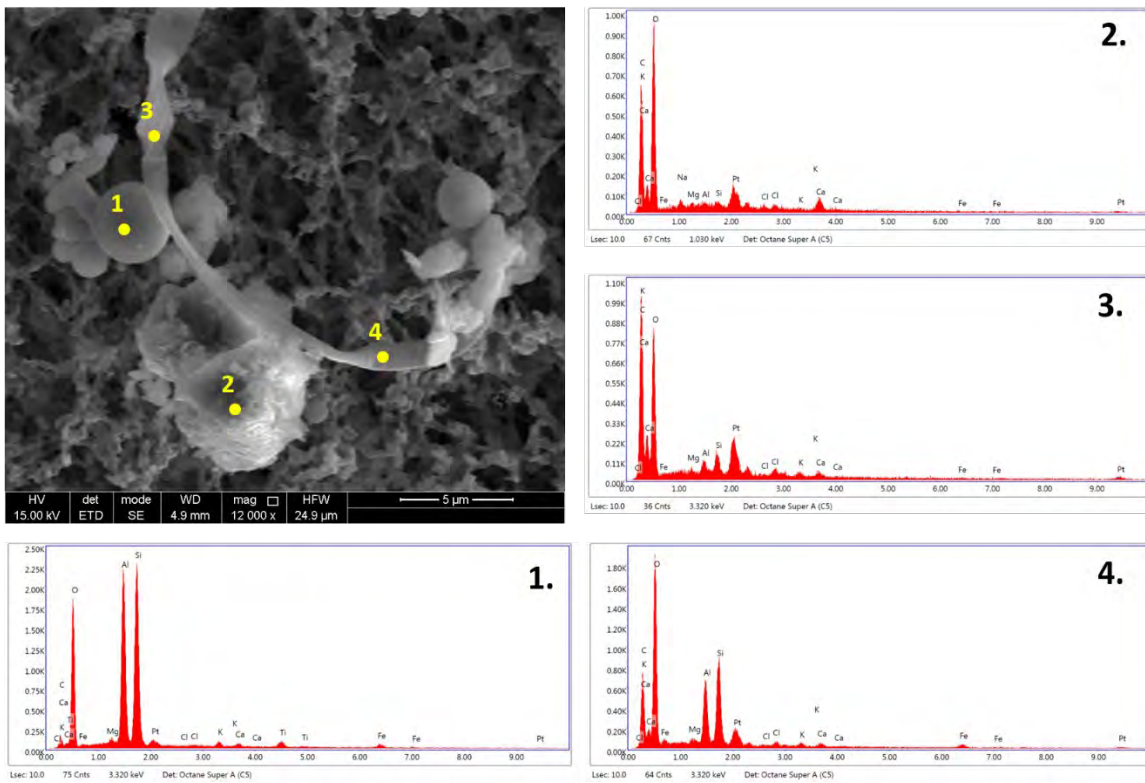


Figure 9a. EDX characterization of the particles identified in sample “21-WB009 | 19.02.2020N-2”.

Your reference: WB21_001

Our reference: 2103BR

21-WB010 | 20.02.20200-1

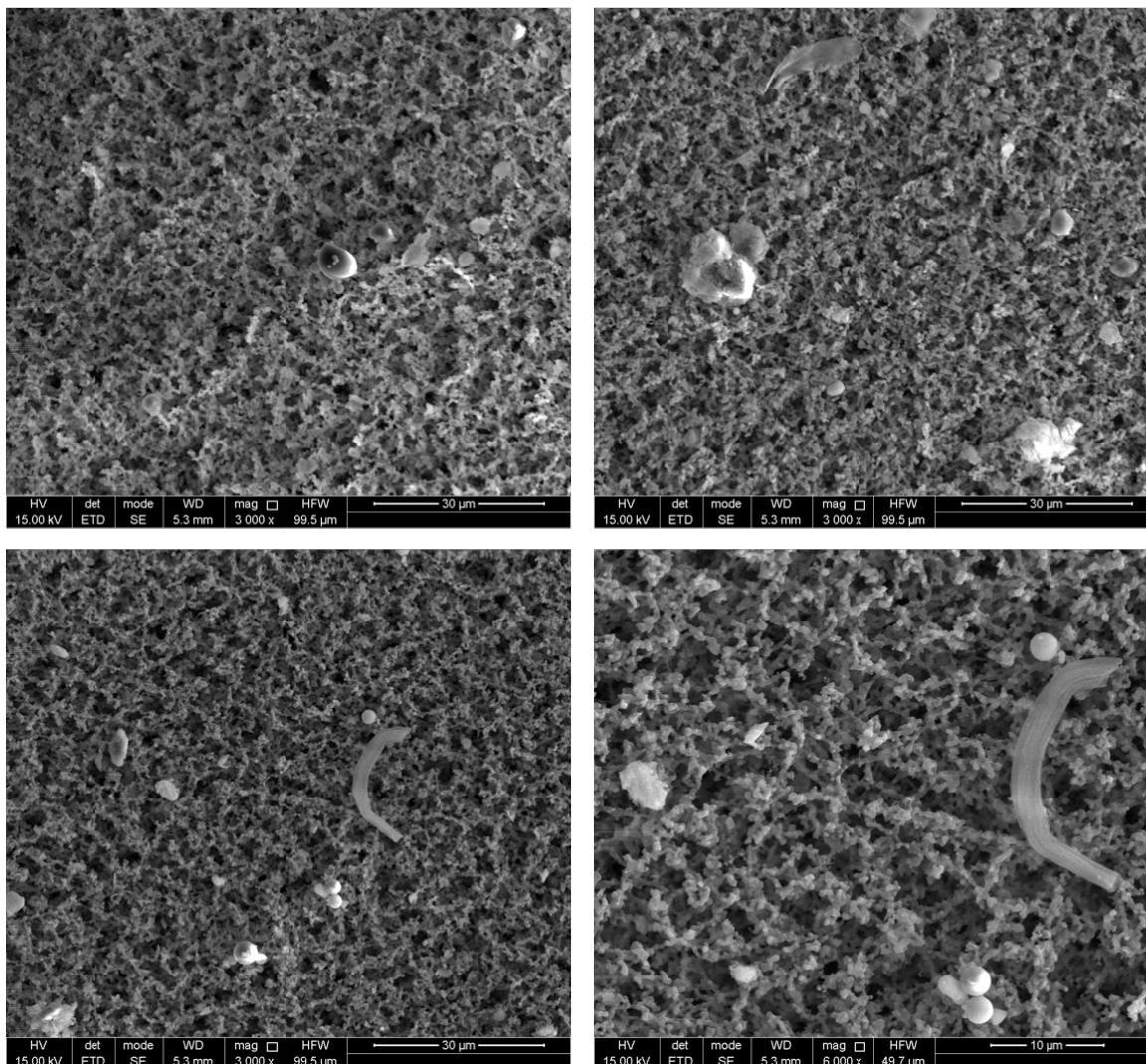


Figure 10. SEM-images with secondary electron detector of the sample “21-WB010 | 20.02.20200-1”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. One single fibre structure was observed in this sample but the fibre has no asbestos appearance. The chemical characterization confirms that it is not an asbestos fibre (see Figure 10a).

Your reference: WB21_001
 Our reference: 2103BR

21-WB010 | 20.02.20200-1

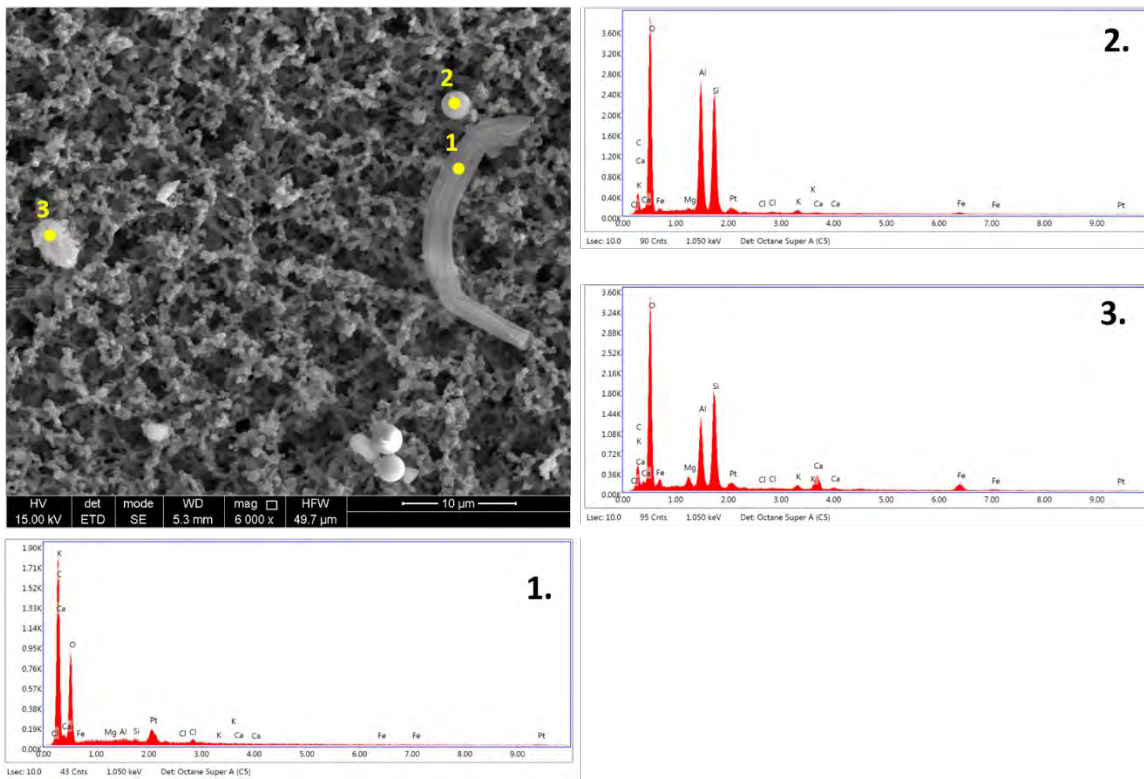


Figure 10a. EDX characterization of the particles identified in sample “21-WB010 | 20.02.20200-1”.

Your reference: WB21_001

Our reference: 2103BR

21-WB011 | 20.02.2020O-2

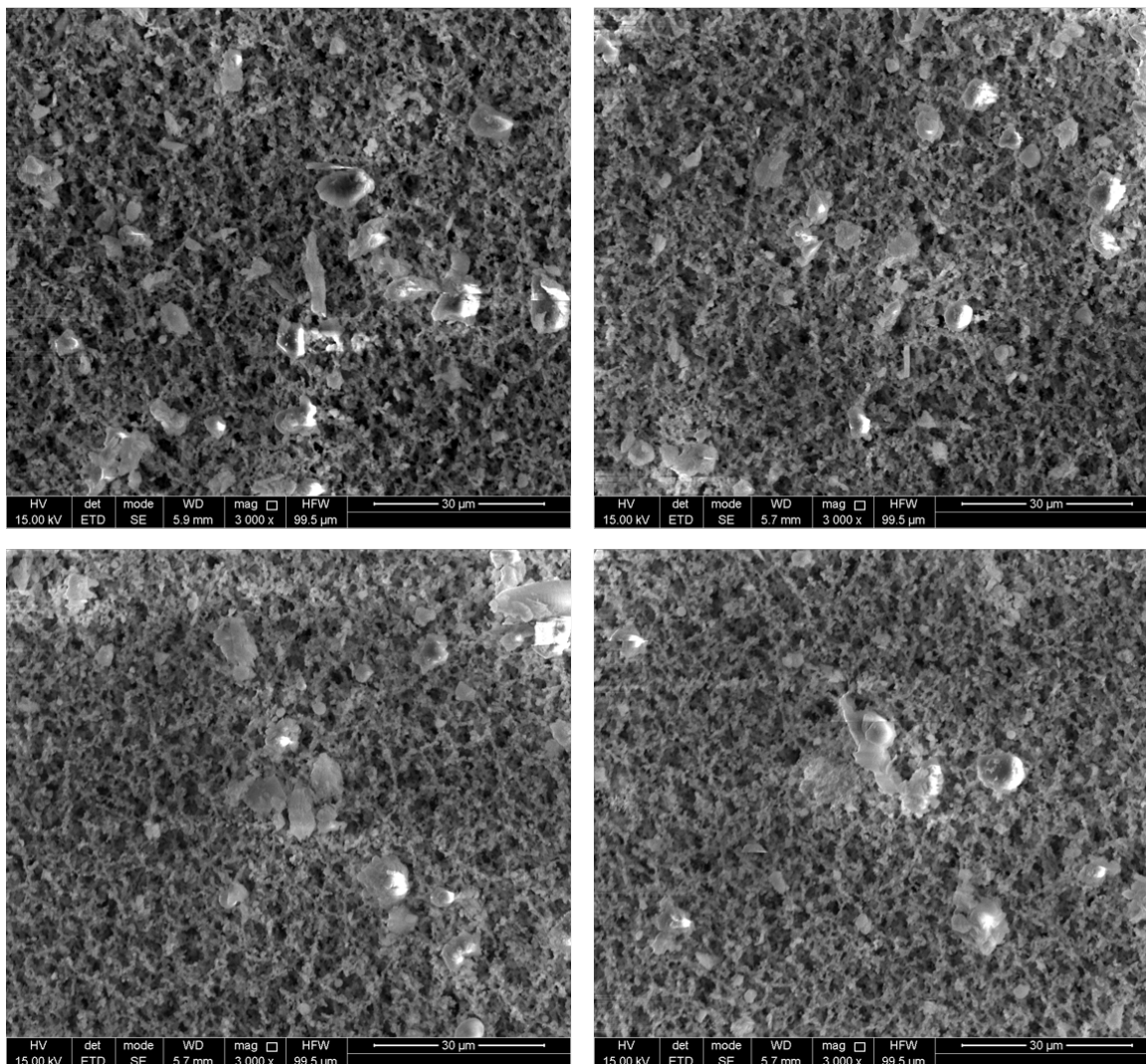


Figure 11. SEM-images with secondary electron detector of the sample “21-WB011 | 20.02.2020O-2”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. The chemical characterization of the particles is shown in Figure 11a.

Your reference: WB21_001
 Our reference: 2103BR

21-WB011 | 20.02.2020O-2

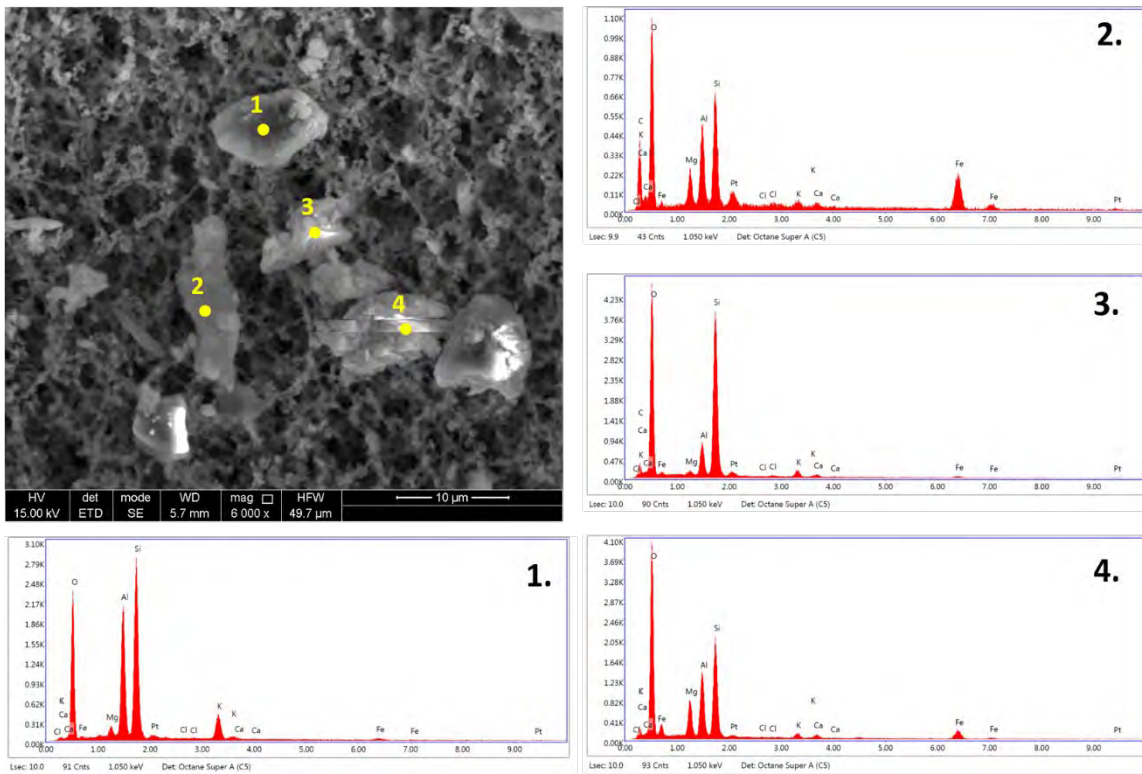


Figure 11a. EDX characterization of the particles identified in sample “21-WB011 | 20.02.2020O-2”.

Your reference: WB21_001

Our reference: 2103BR

21-WB012 | 20.02.20200-3

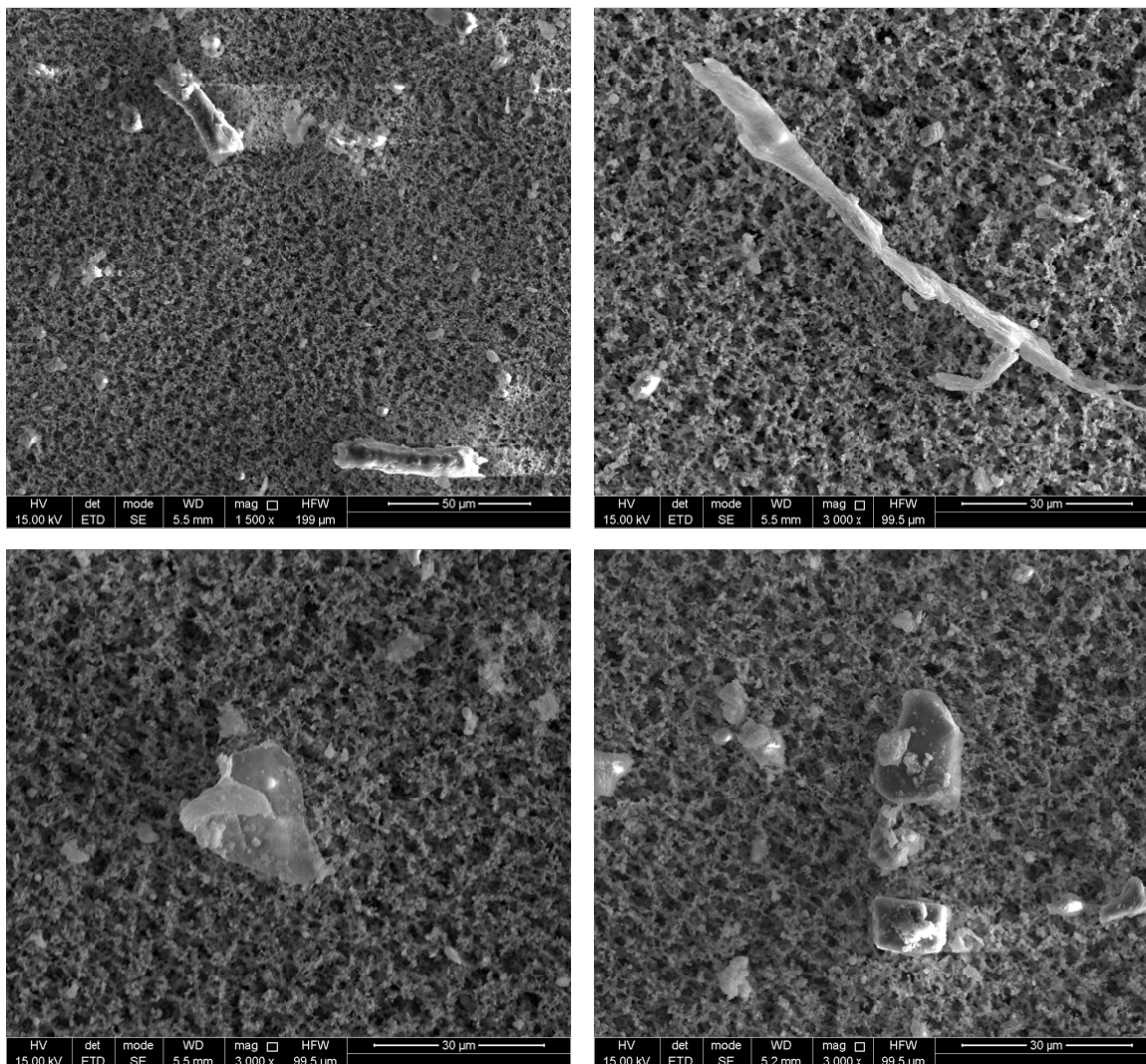


Figure 12. SEM-images with secondary electron detector of the sample “21-WB012 | 20.02.20200-3”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. One single fibre structure was observed in this sample but the fibre has no asbestos appearance. The chemical characterization confirms that it is not an asbestos fibre (see Figure 12a).

Your reference: WB21_001
 Our reference: 2103BR

21-WB012 | 20.02.2020-3

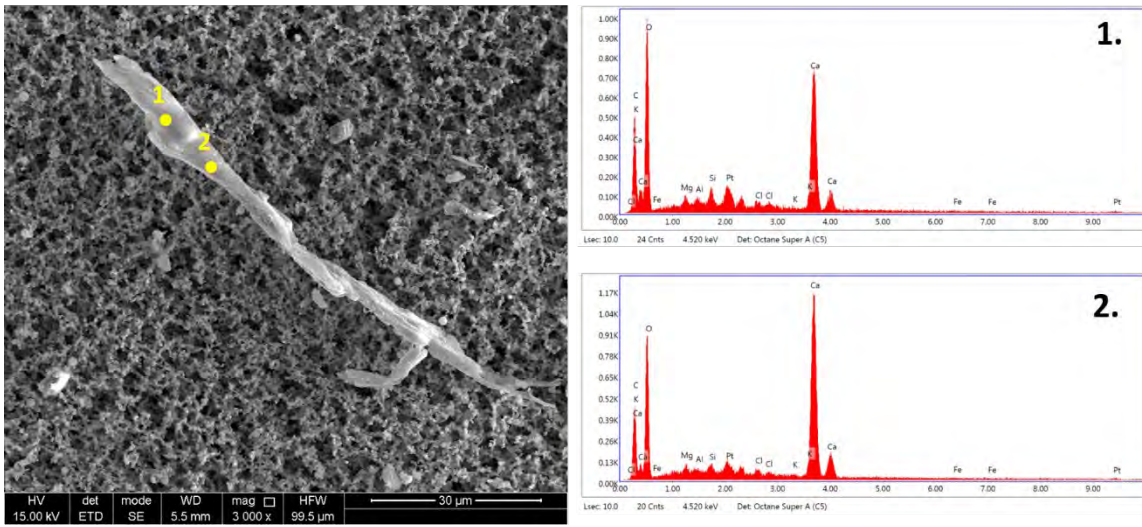


Figure 12a. EDX characterization of the particles identified in sample “21-WB012 | 20.02.2020-3”.

Your reference: WB21_001

Our reference: 2103BR

21-WB013 | 20.02.2020O-4

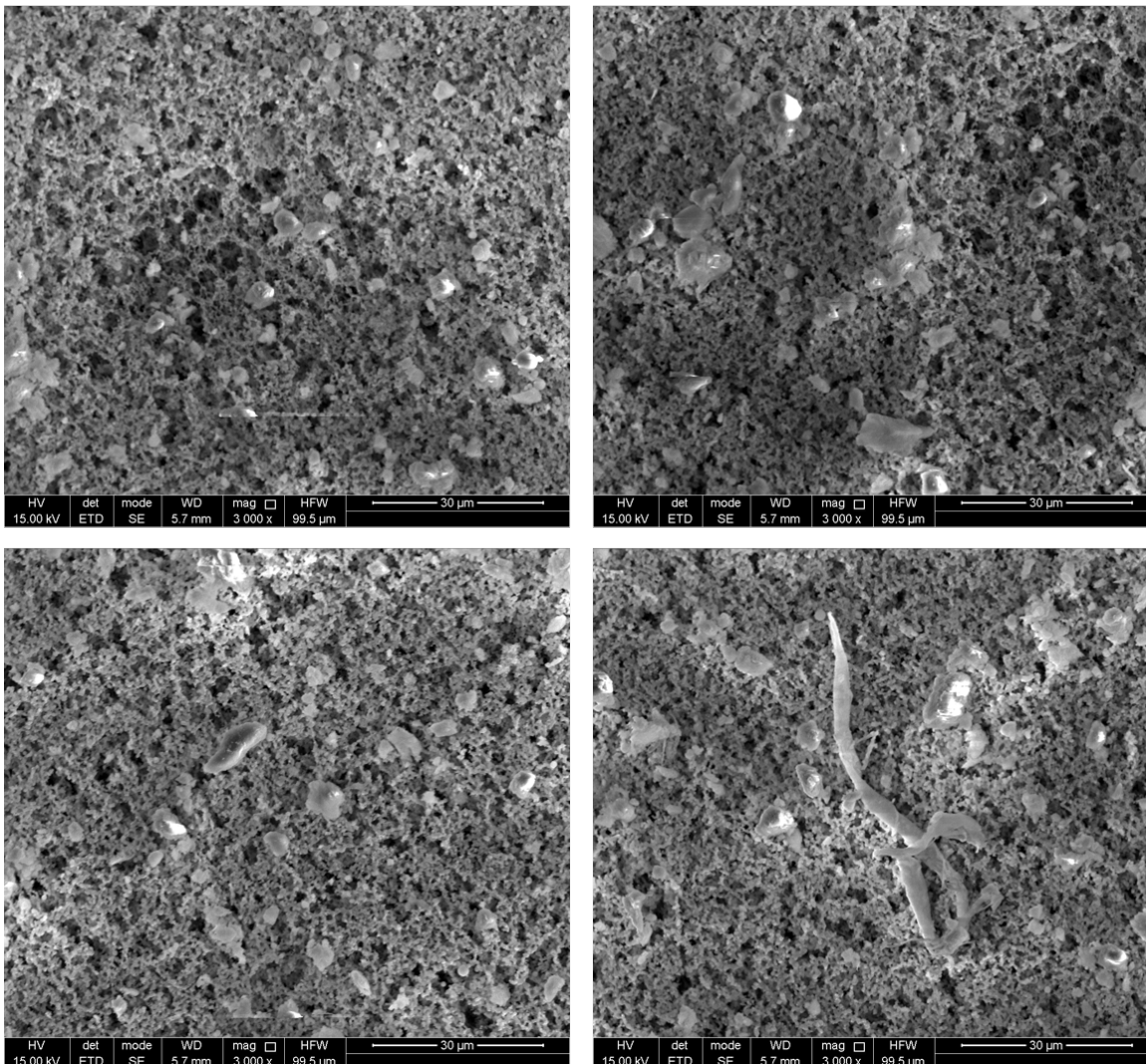


Figure 13. SEM-images with secondary electron detector of the sample “21-WB013 | 20.02.2020O-4”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. One single fibre structure was observed in this sample but the fibre has no asbestos appearance. The chemical characterization of the particles is shown in Figure 13a.

Your reference: WB21_001
 Our reference: 2103BR

21-WB013 | 20.02.2020-4

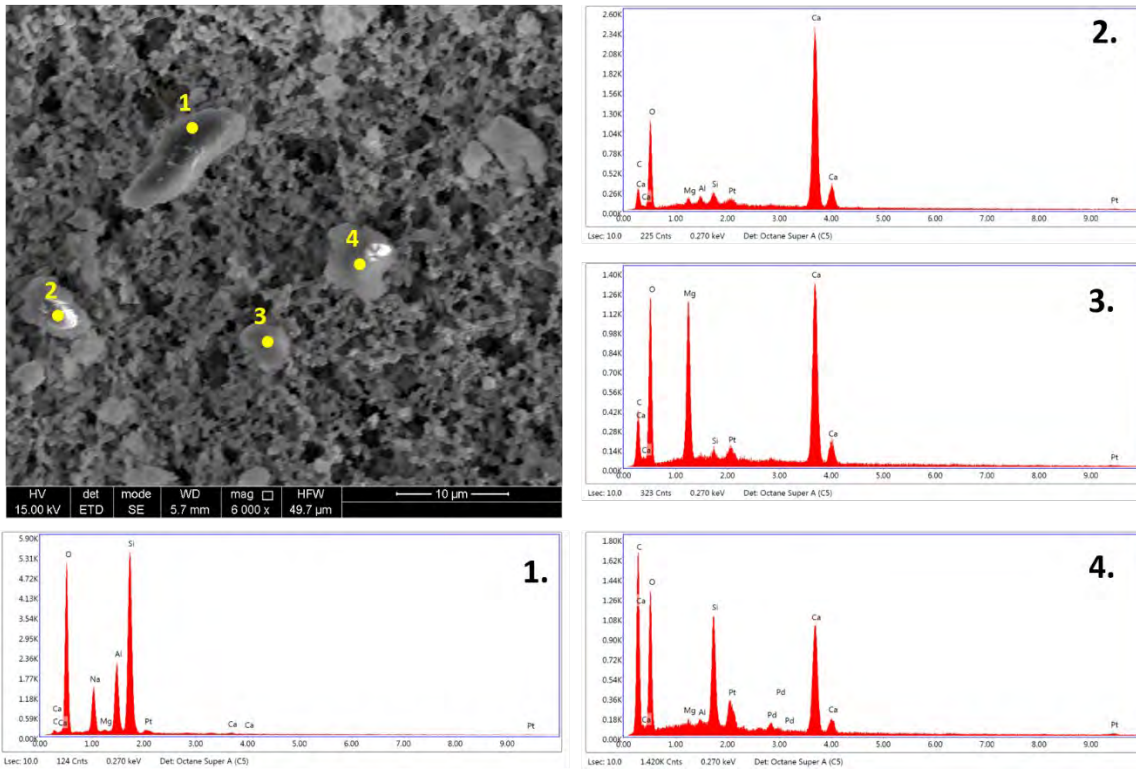


Figure 13a. EDX characterization of the particles identified in sample “21-WB013 | 20.02.2020-4”.

Your reference: WB21_001

Our reference: 2103BR

21-WB014 | 20.02.2020O-5

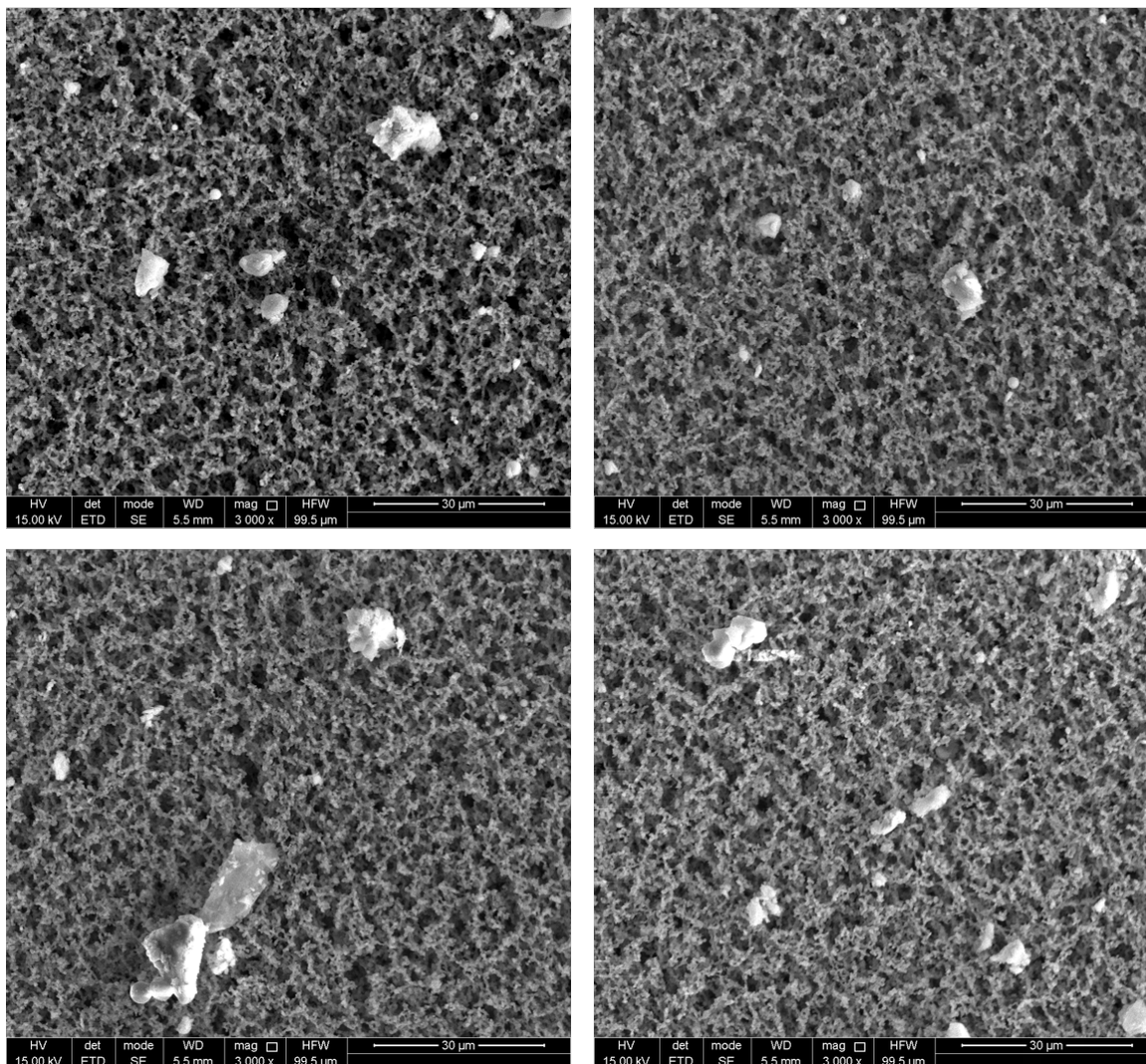


Figure 14. SEM-images with secondary electron detector of the sample “21-WB014 | 20.02.2020O-5”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. The chemical characterization of the particles is shown in Figure 14a.

Your reference: WB21_001
 Our reference: 2103BR

21-WB014 | 20.02.2020O-5

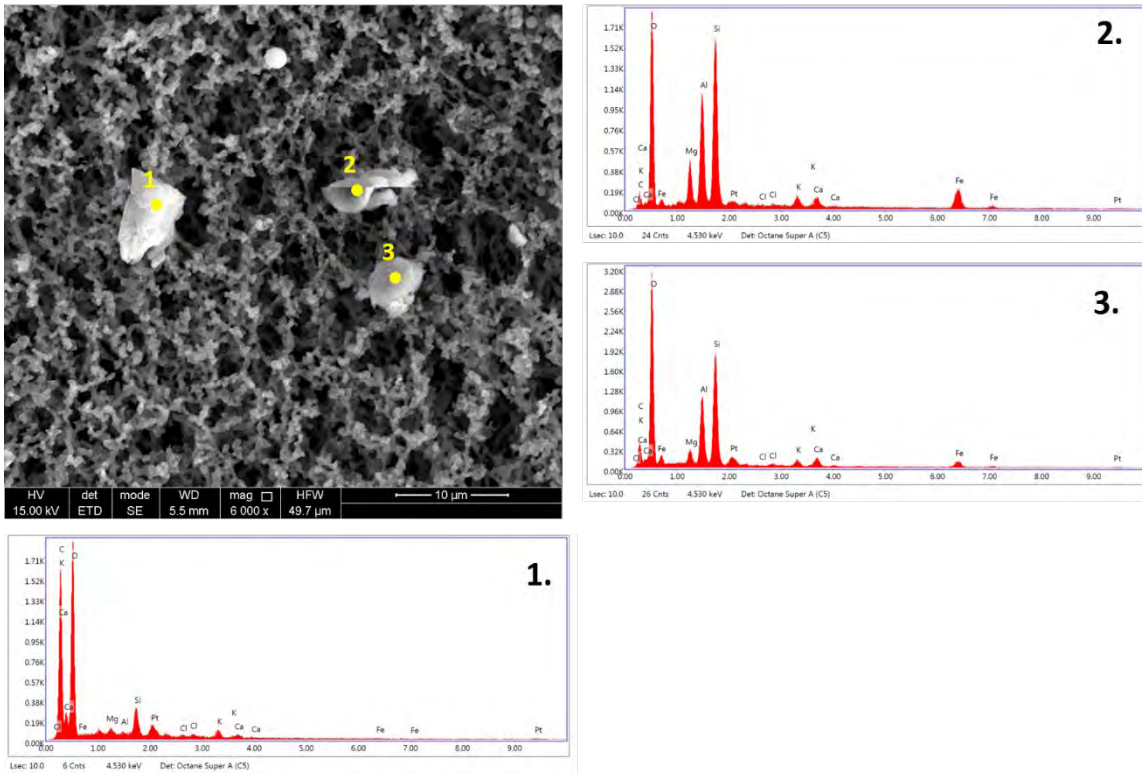


Figure 14a. EDX characterization of the particles identified in sample “21-WB014 | 20.02.2020O-5”.

Your reference: WB21_001

Our reference: 2103BR

21-WB015 | 20.02.2020N-1

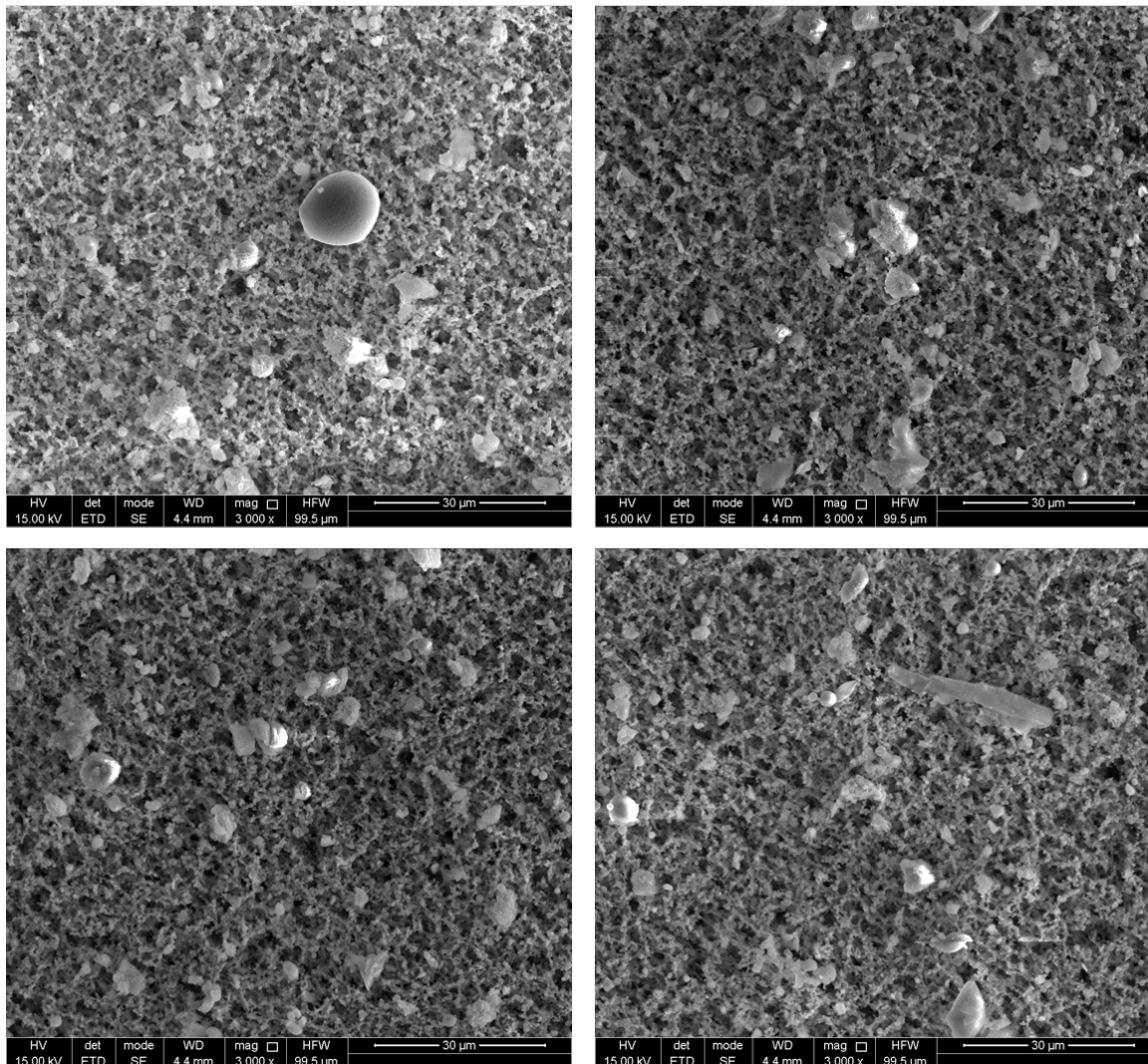


Figure 15. SEM-images with secondary electron detector of the sample “21-WB015 | 20.02.2020N-1”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. The chemical characterization of the particles is shown in Figure 15a.

Your reference: WB21_001
 Our reference: 2103BR

21-WB015 | 20.02.2020N-1

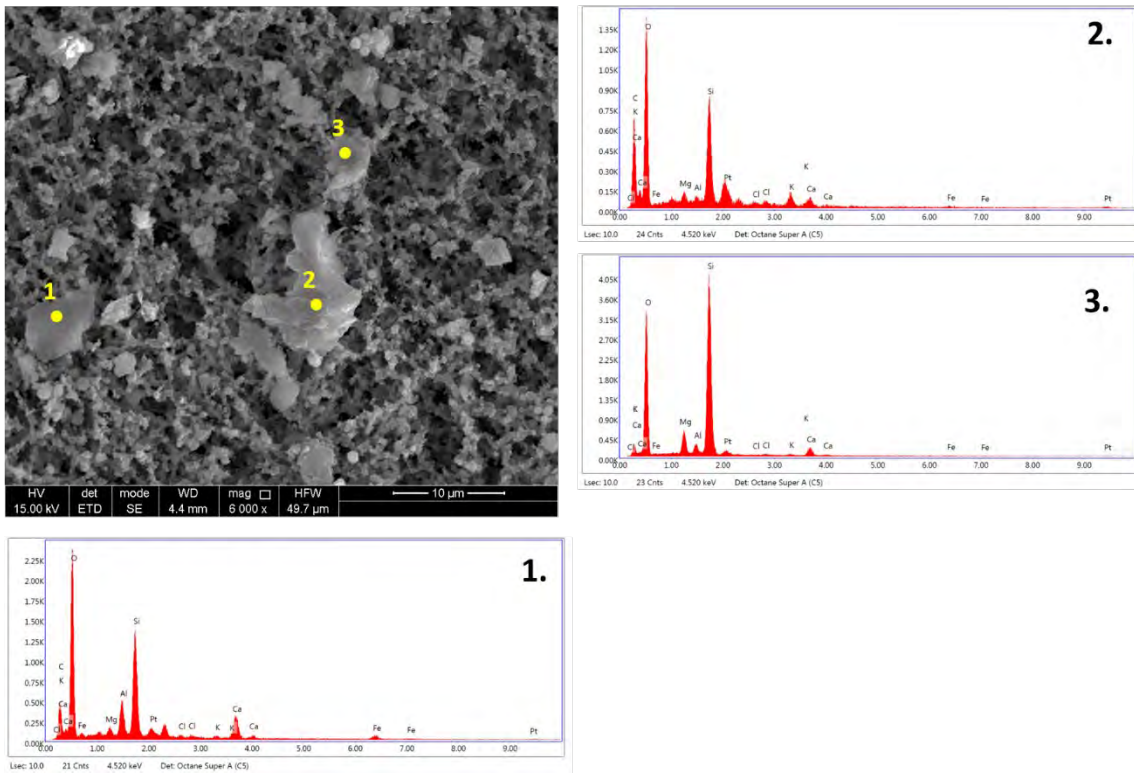


Figure 15a. EDX characterization of the particles identified in sample “21-WB015 | 20.02.2020N-1”.

Your reference: WB21_001

Our reference: 2103BR

21-WB016 | 20.02.2020N-2

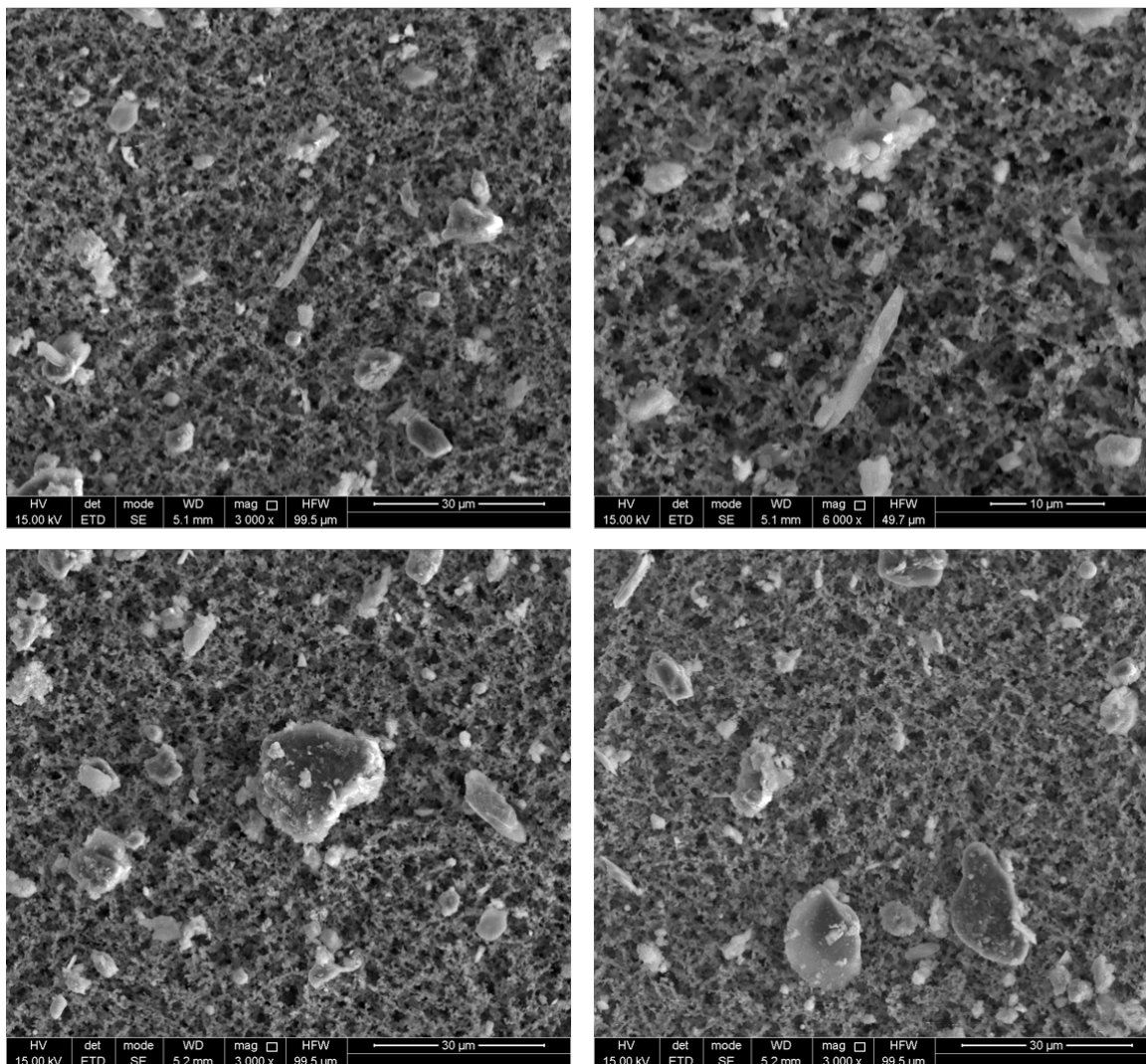


Figure 16. SEM-images with secondary electron detector of the sample “21-WB016 | 20.02.2020N-2”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. The chemical characterization of the particles is shown in Figure 16a.

Your reference: WB21_001
 Our reference: 2103BR

21-WB016 | 20.02.2020N-2

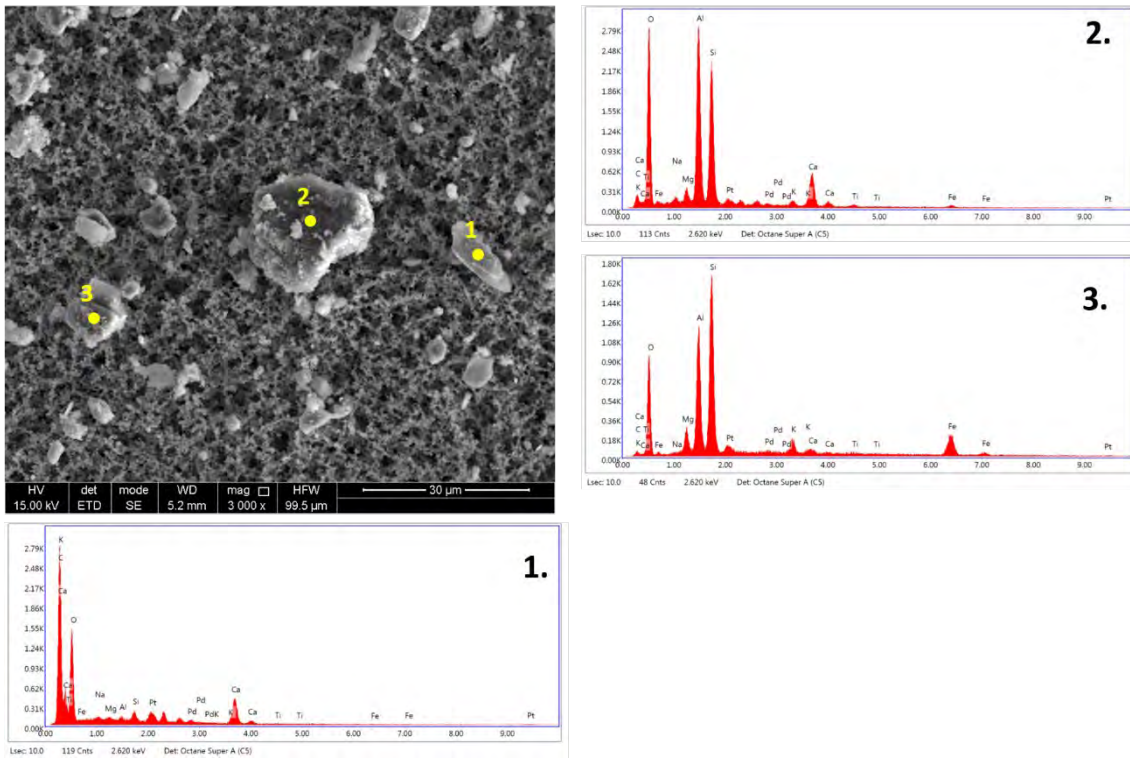


Figure 16a. EDX characterization of the particles identified in sample “21-WB016 | 20.02.2020N-2”.

Your reference: WB21_001

Our reference: 2103BR

21-WB017 | 21.02.2020O-1

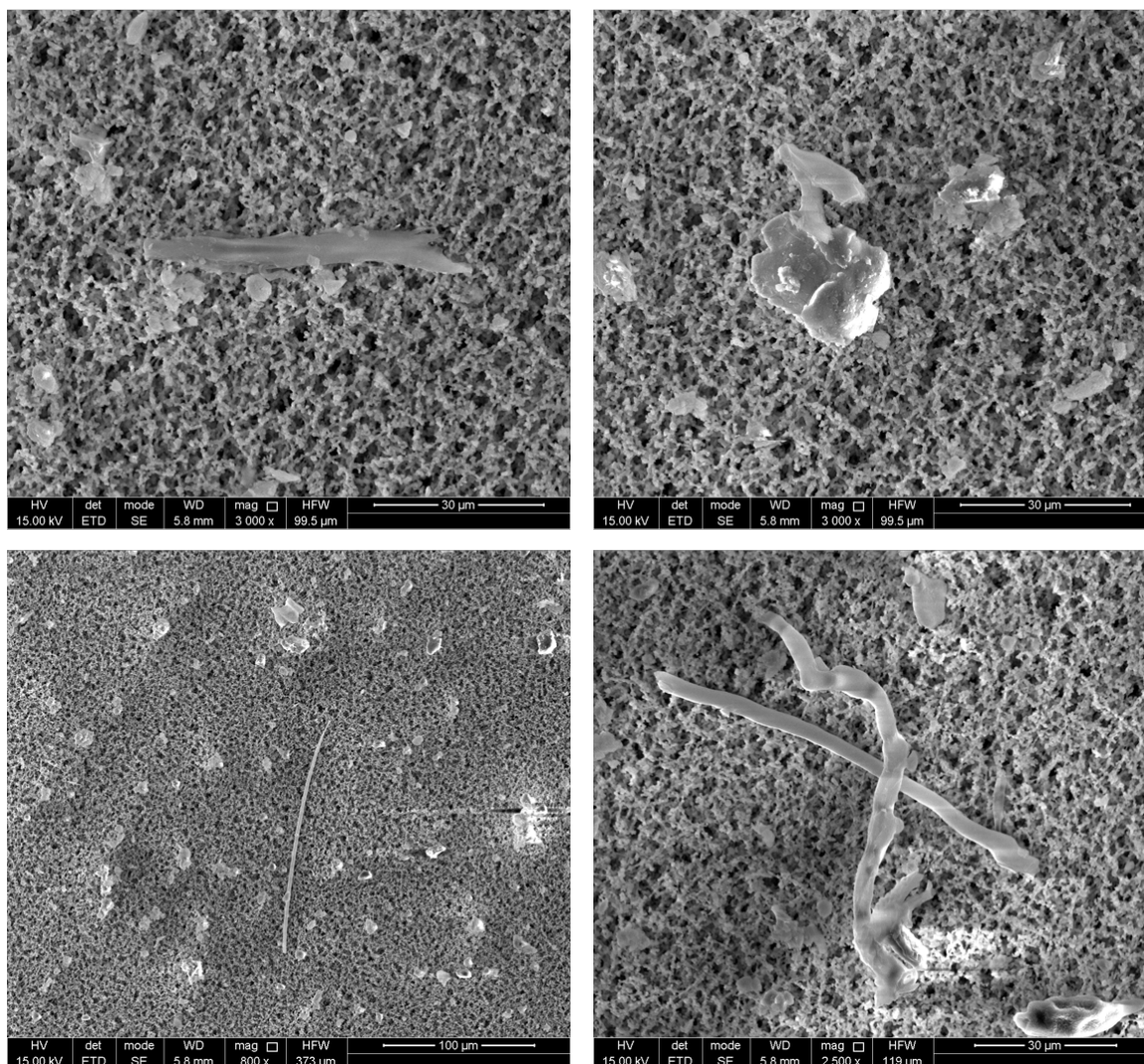


Figure 17. SEM-images with secondary electron detector of the sample “21-WB017 | 21.02.2020O-1”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. Four single fibre structures were observed in this sample but the fibres have no asbestos appearance. The chemical characterization of the particles is shown in Figure 17a.

Your reference: WB21_001
Our reference: 2103BR

21-WB017 | 21.02.20200-1

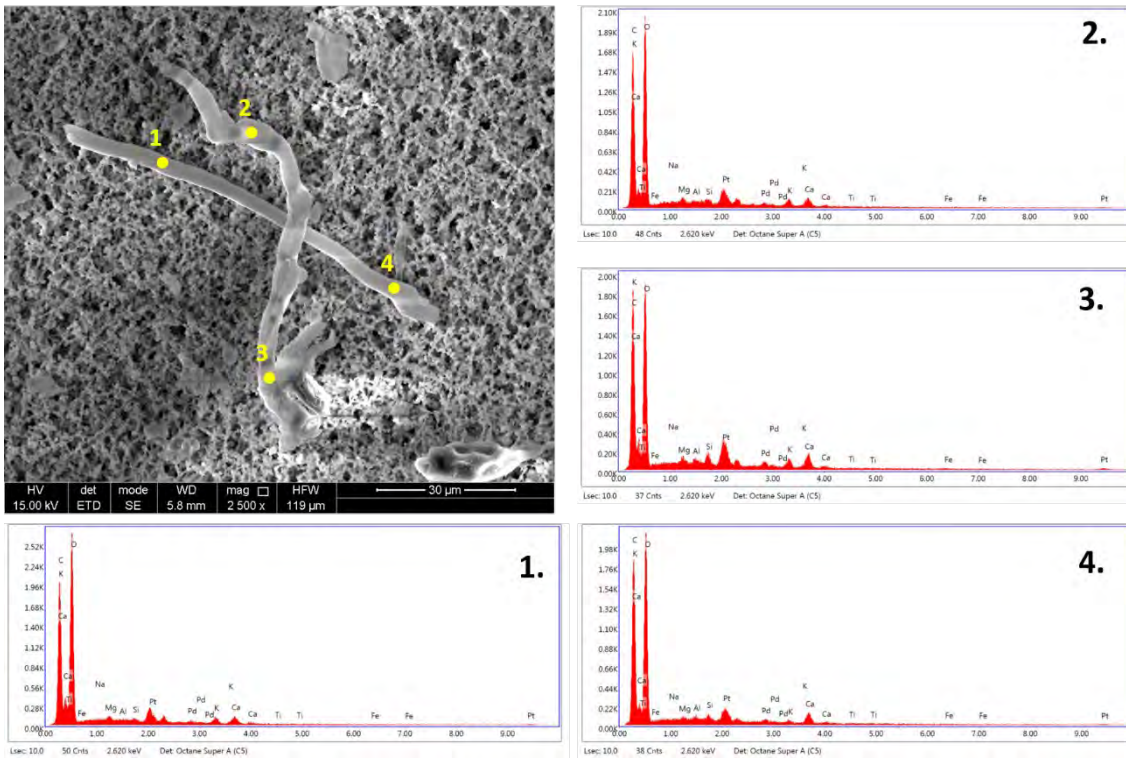


Figure 17a. EDX characterization of the particles identified in sample “21-WB017 | 21.02.20200-1”.

Your reference: WB21_001

Our reference: 2103BR

21-WB018 | 21.02.2020O-2

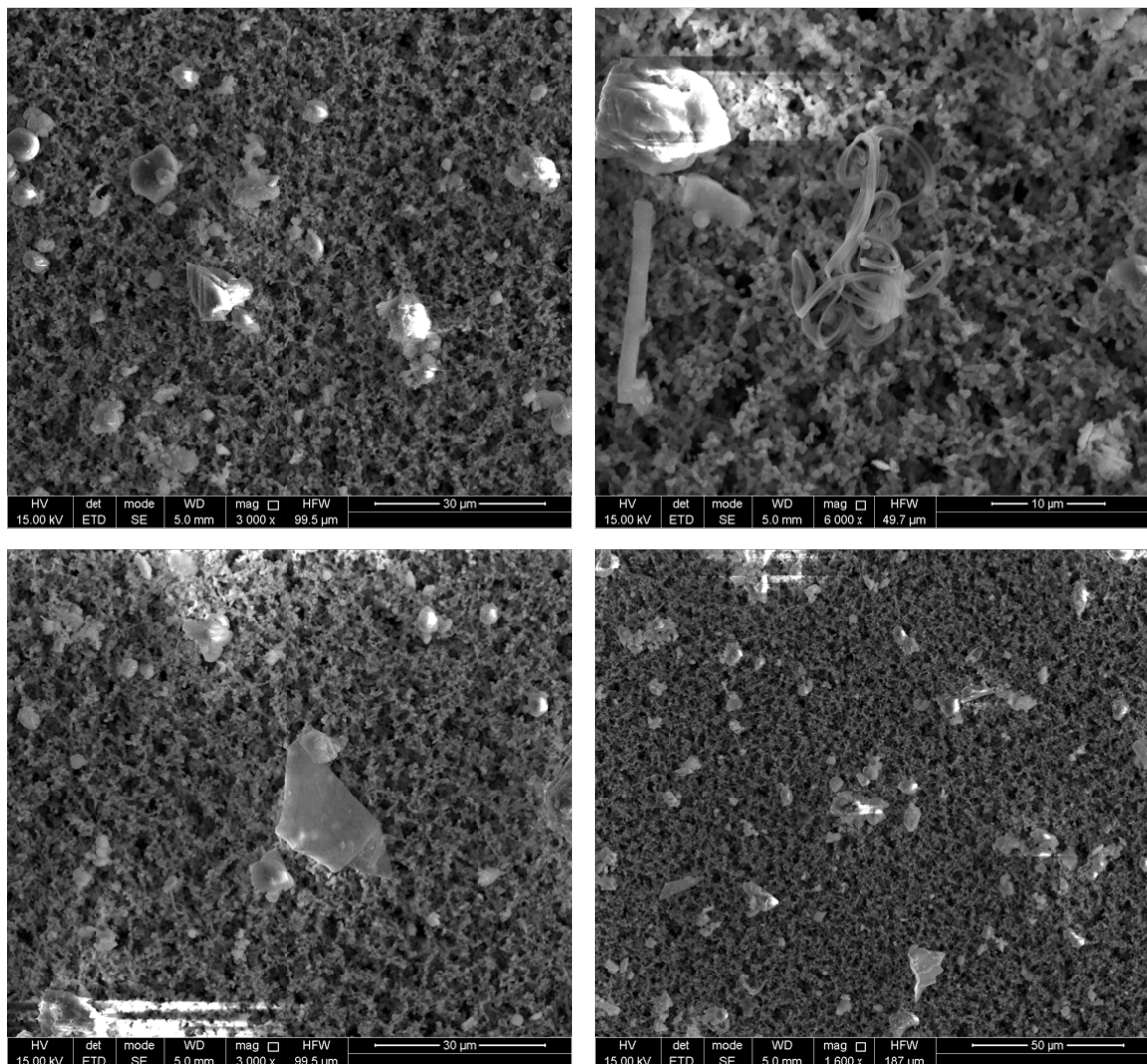


Figure 18. SEM-images with secondary electron detector of the sample “21-WB018 | 21.02.2020O-2”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. One single fibre structure was observed in this sample but the fibre has no asbestos appearance. The chemical characterization of the particles is shown in Figure 18a.

Your reference: WB21_001
 Our reference: 2103BR

21-WB018 | 21.02.20200-2

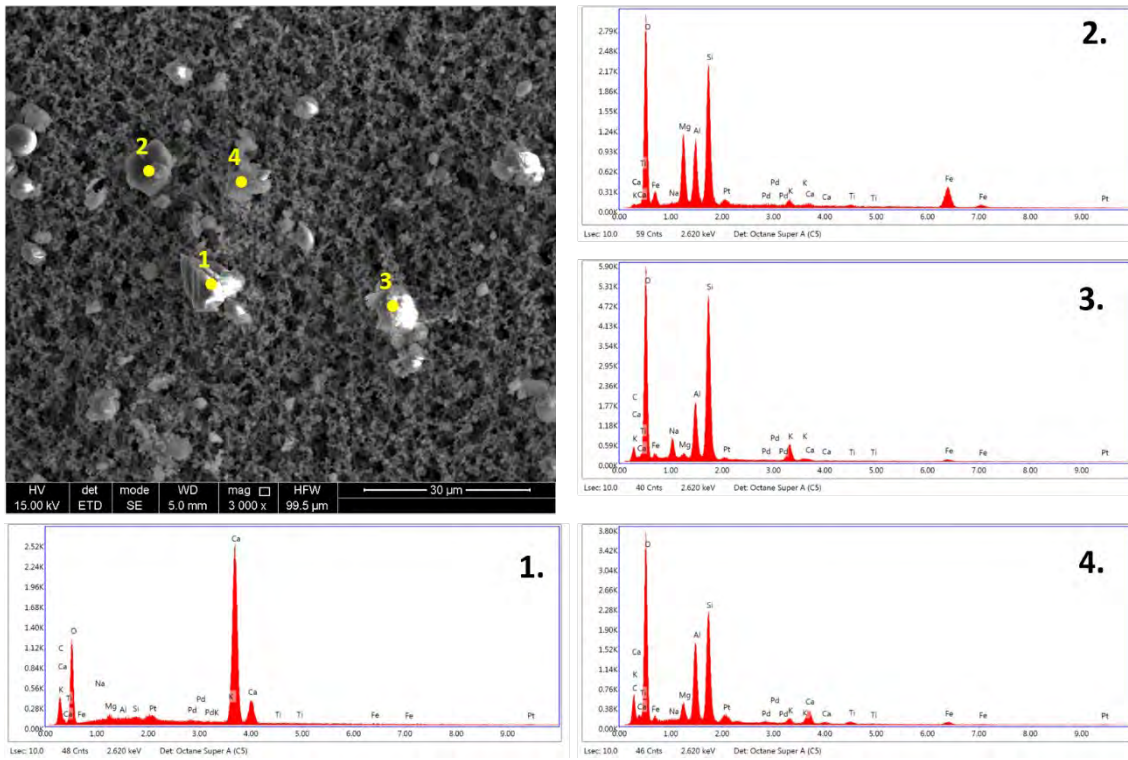


Figure 18a. EDX characterization of the particles identified in sample “21-WB018 | 21.02.20200-2”.

Your reference: WB21_001

Our reference: 2103BR

21-WB019 | 21.02.20200-3

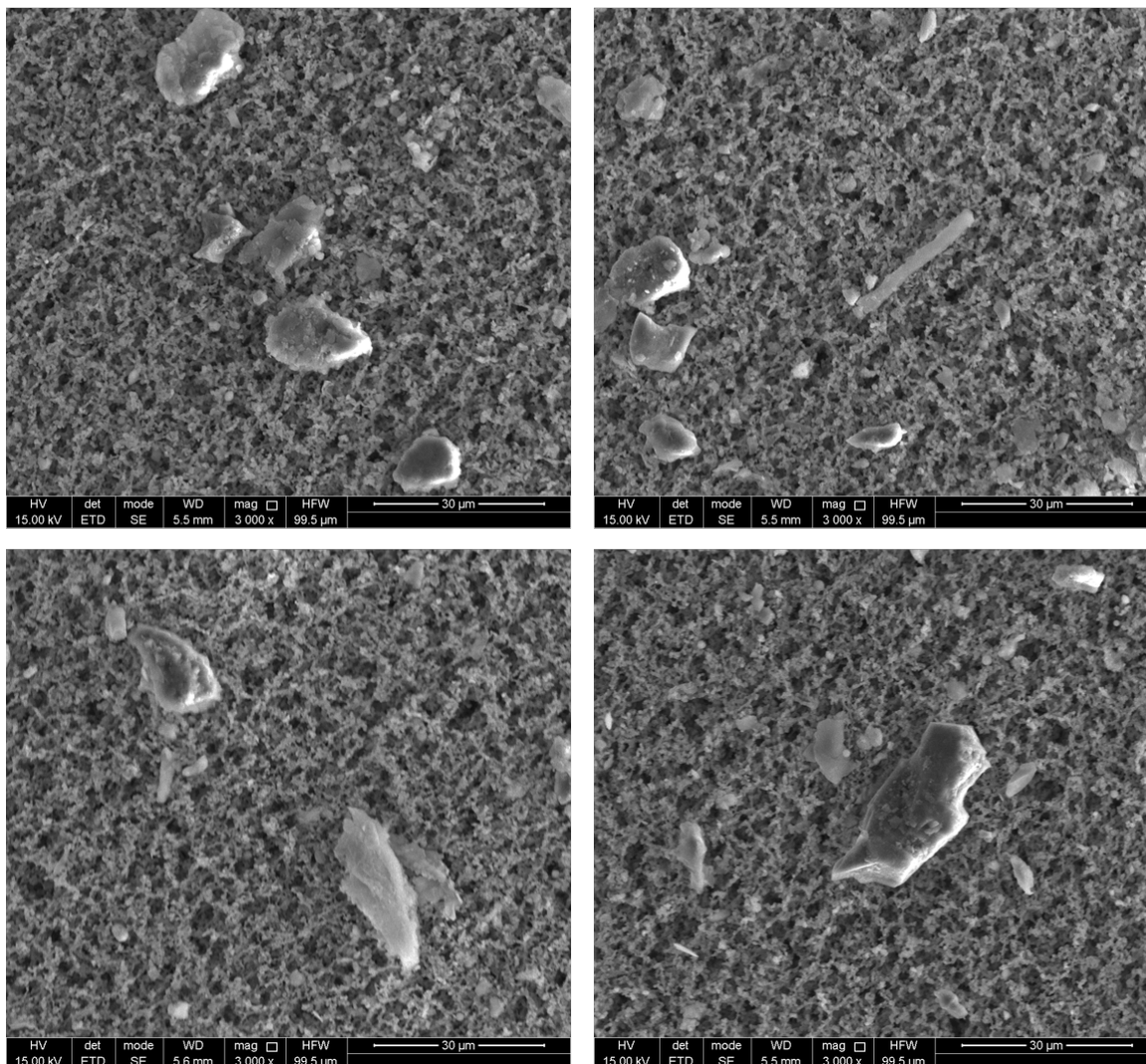


Figure 19. SEM-images with secondary electron detector of the sample “21-WB019 | 21.02.20200-3”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. One single fibre structure was observed in this sample but the fibre has no asbestos appearance. The chemical characterization of the particles is shown in Figure 19a.

Your reference: WB21_001
 Our reference: 2103BR

21-WB019 | 21.02.20200-3

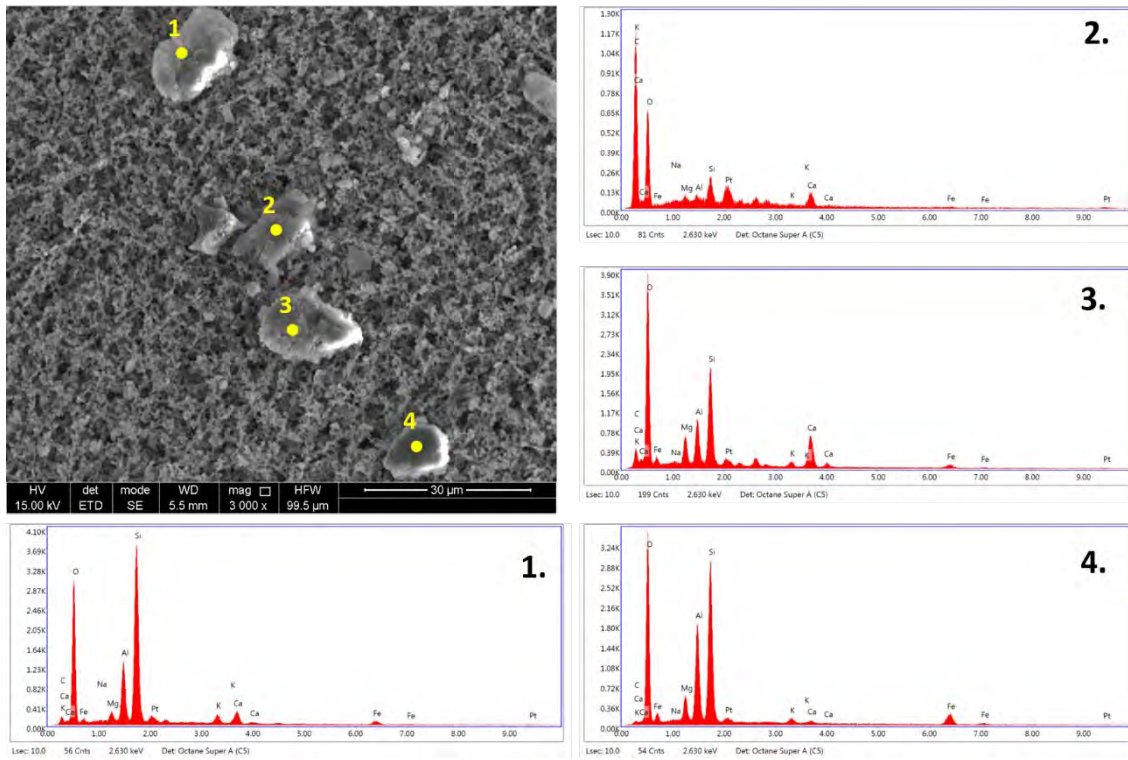


Figure 19a. EDX characterization of the particles identified in sample “21-WB019 | 21.02.20200-3”.

Your reference: WB21_001
Our reference: 2103BR

21-WB020 | 21.02.2020O-4

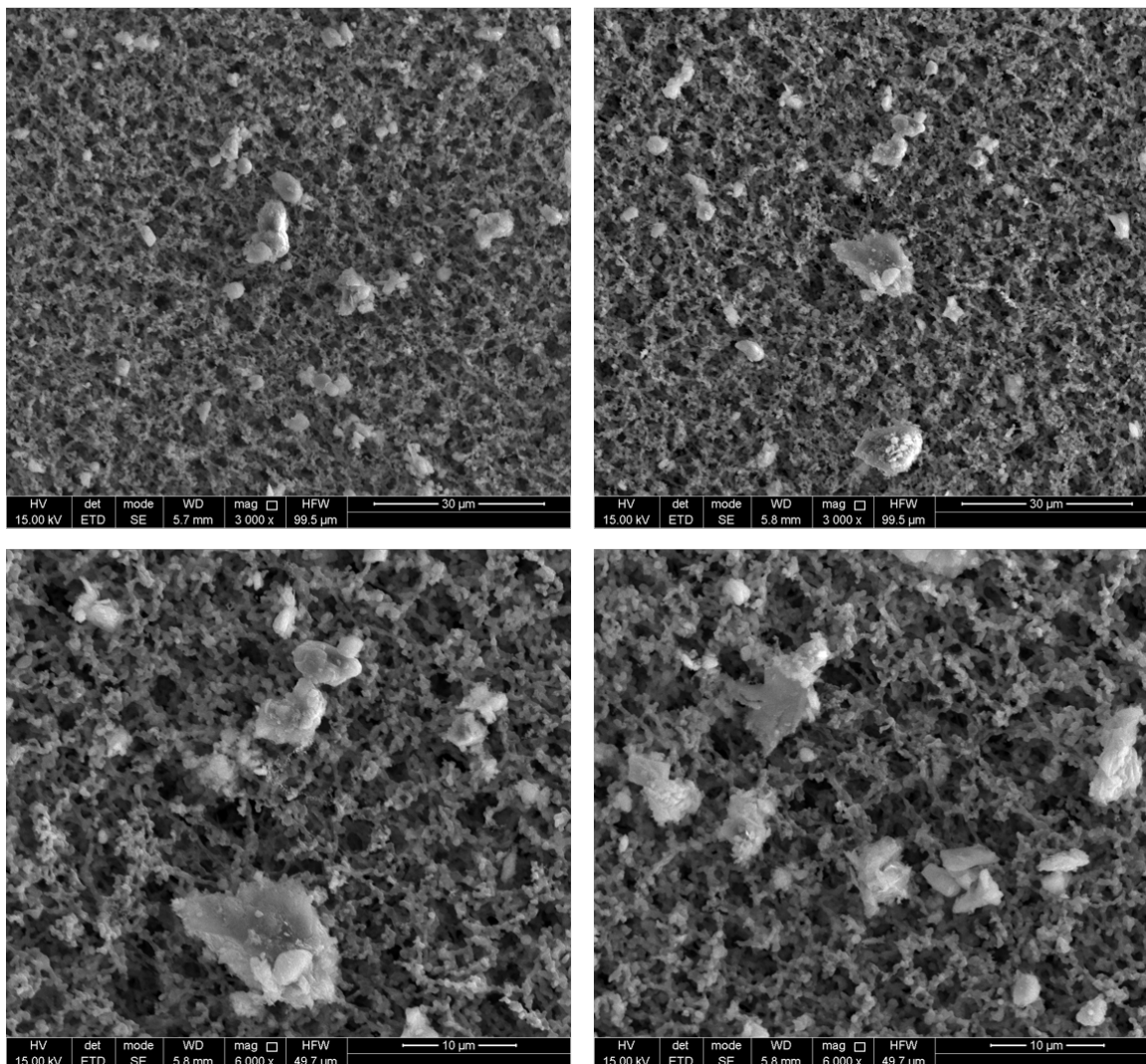


Figure 20. SEM-images with secondary electron detector of the sample “21-WB020 | 21.02.2020O-4”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. The chemical characterization of the particles is shown in Figure 20a.

Your reference: WB21_001
 Our reference: 2103BR

21-WB020 | 21.02.20200-4

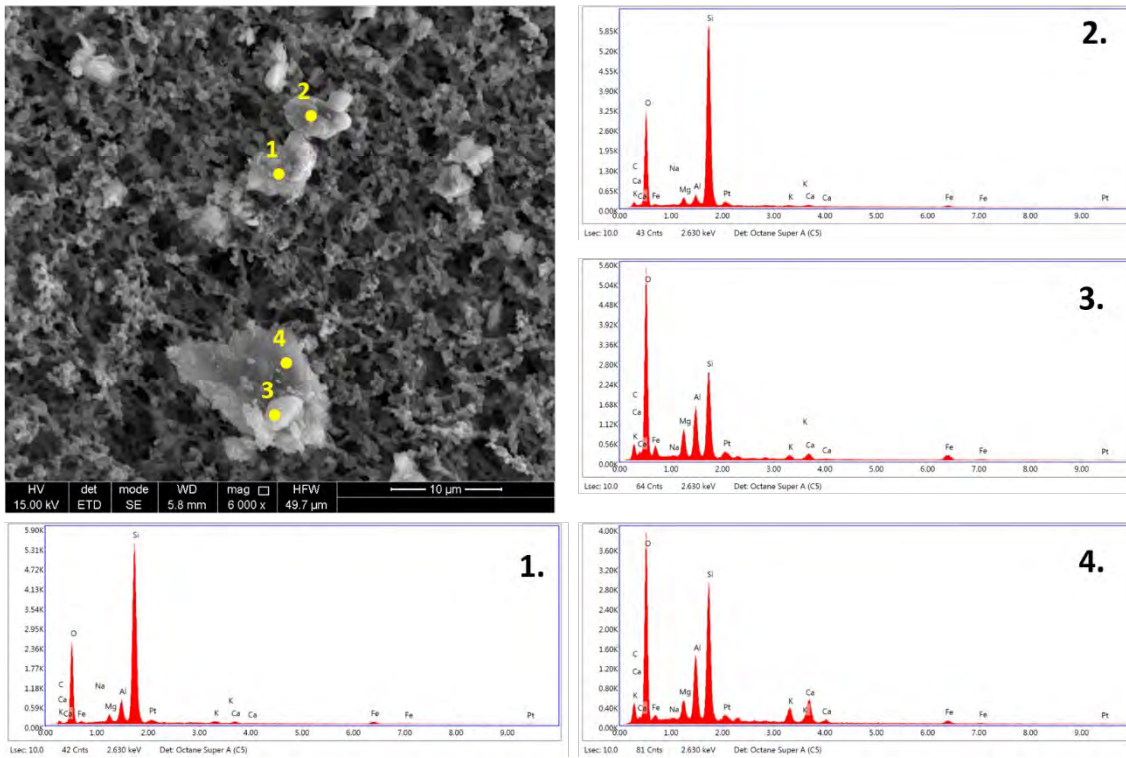


Figure 20a. EDX characterization of the particles identified in sample “21-WB020 | 21.02.20200-4”.

Your reference: WB21_001

Our reference: 2103BR

21-WB021 | 21.02.2020O-5

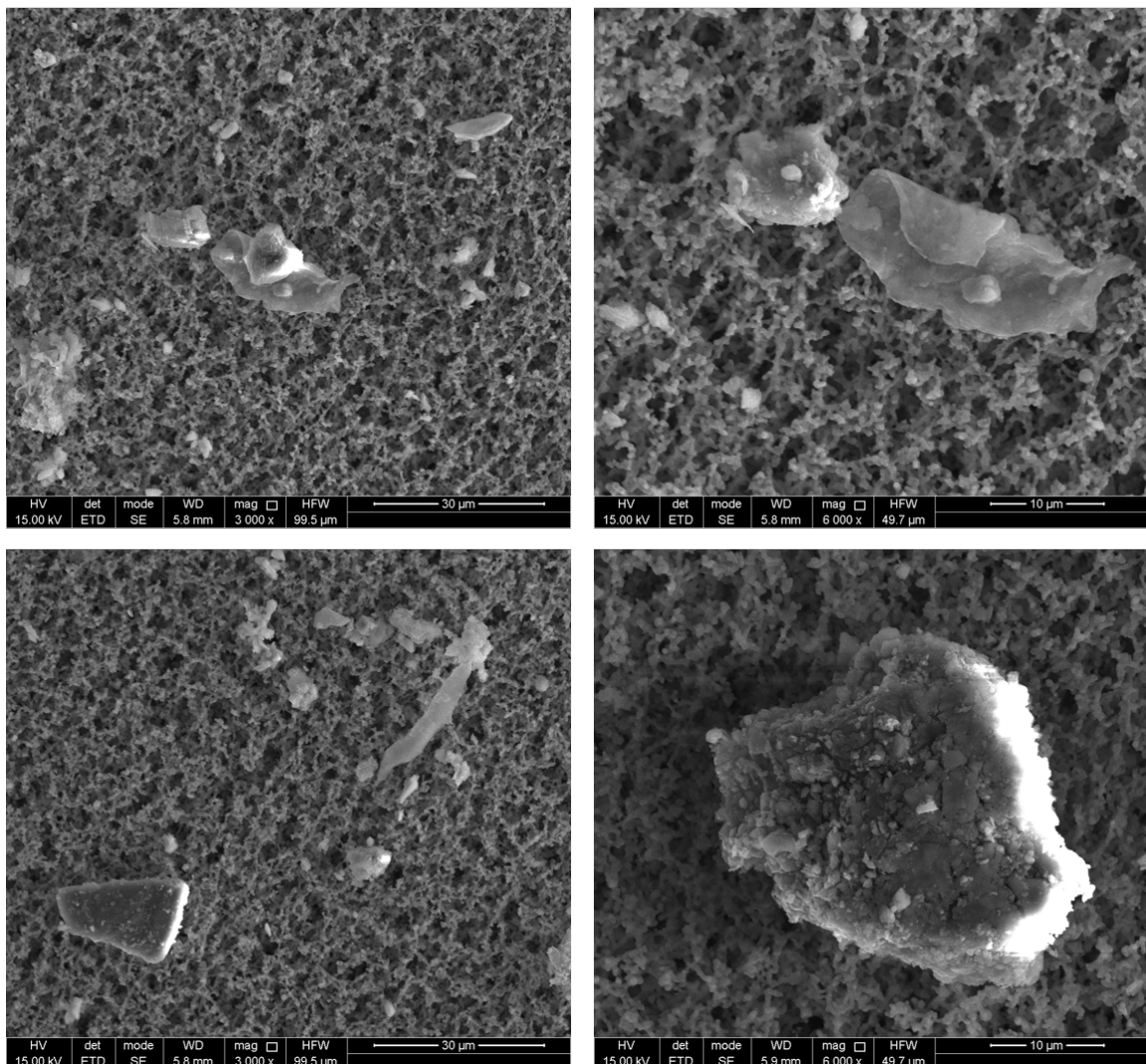


Figure 21. SEM-images with secondary electron detector of the sample “21-WB021 | 21.02.2020O-5”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. One single fibre structure was observed in this sample but the fibre has no asbestos appearance. The chemical characterization of the particles is shown in Figure 21a.

Your reference: WB21_001
 Our reference: 2103BR

21-WB021 | 21.02.20200-5

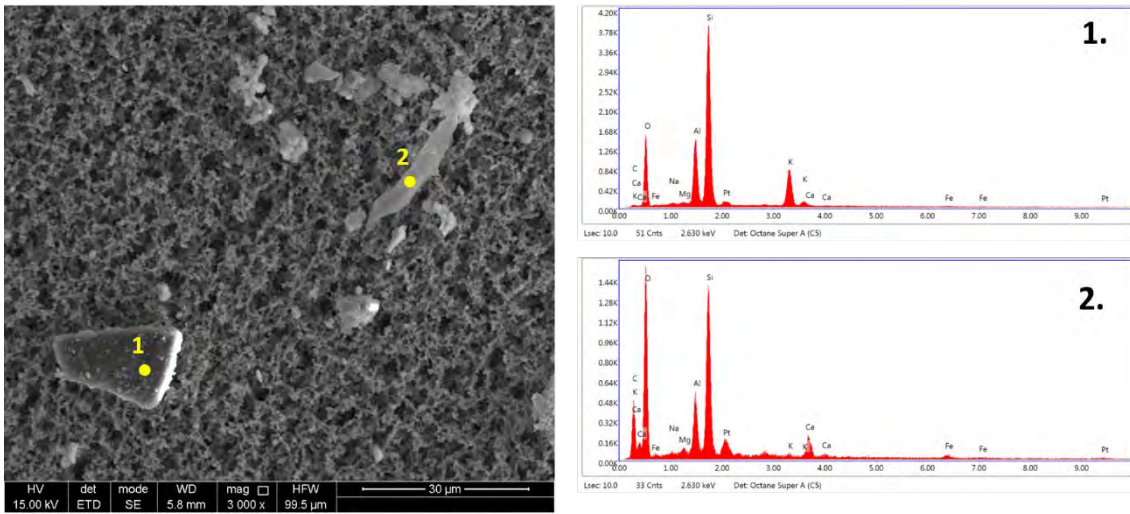


Figure 21a. EDX characterization of the particles identified in sample “21-WB021 | 21.02.20200-5”.

Your reference: WB21_001

Our reference: 2103BR

21-WB022 | 21.02.2020N-1

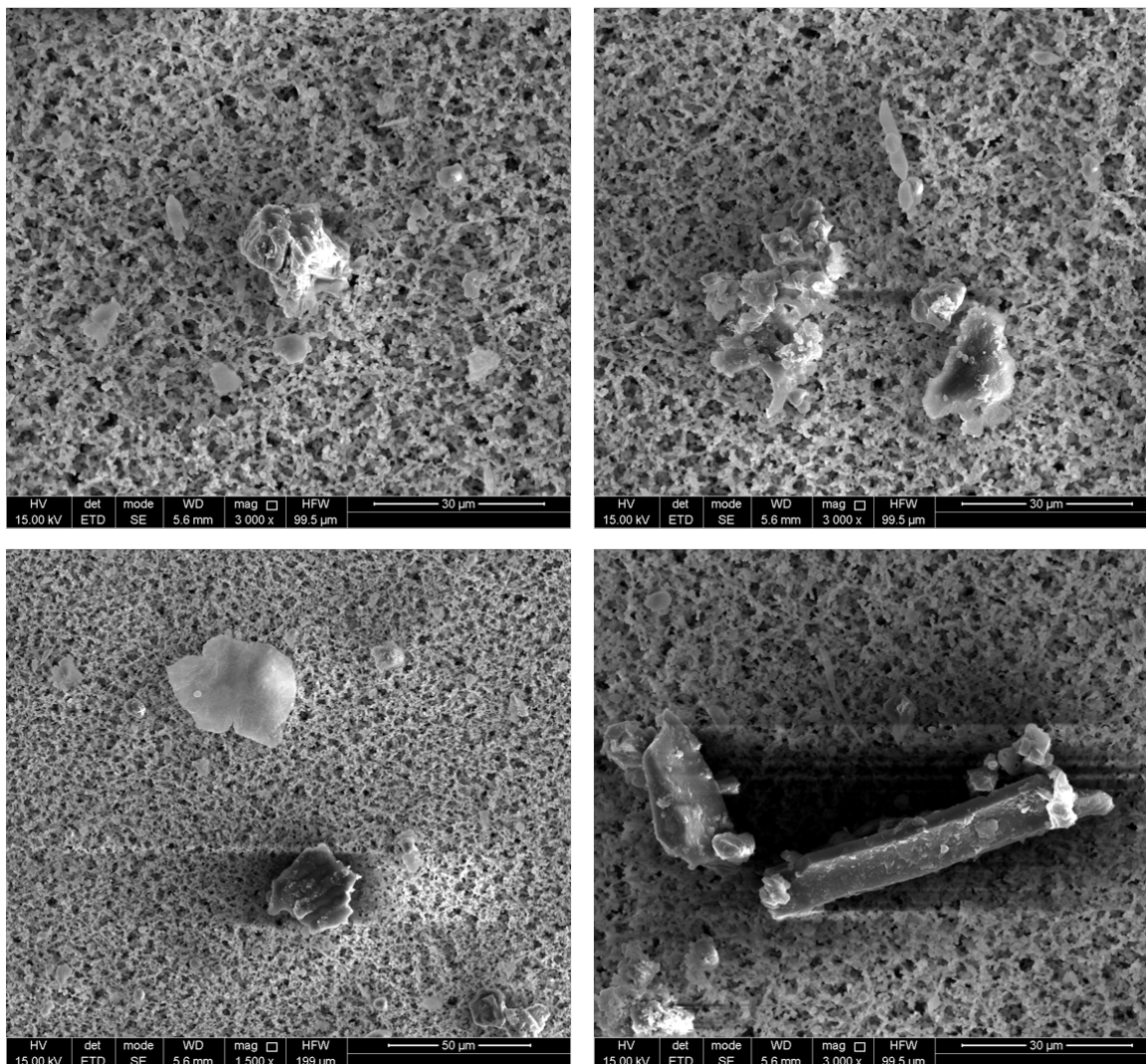


Figure 22. SEM-images with secondary electron detector of the sample “21-WB022 | 21.02.2020N-1”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. One single fibre structure was observed in this sample but the fibre has no asbestos appearance. The chemical characterization of the particles is shown in Figure 22a.

Your reference: WB21_001
 Our reference: 2103BR

21-WB022 | 21.02.2020N-1

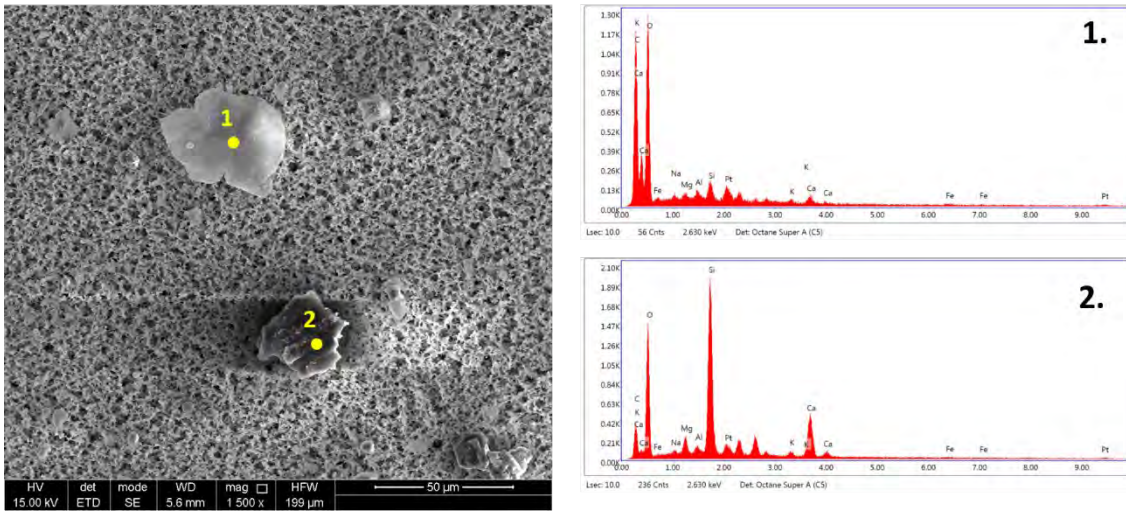


Figure 22a. EDX characterization of the particles identified in sample “21-WB022 | 21.02.2020N-1”.

Your reference: WB21_001

Our reference: 2103BR

21-WB023 | 21.02.2020N-2

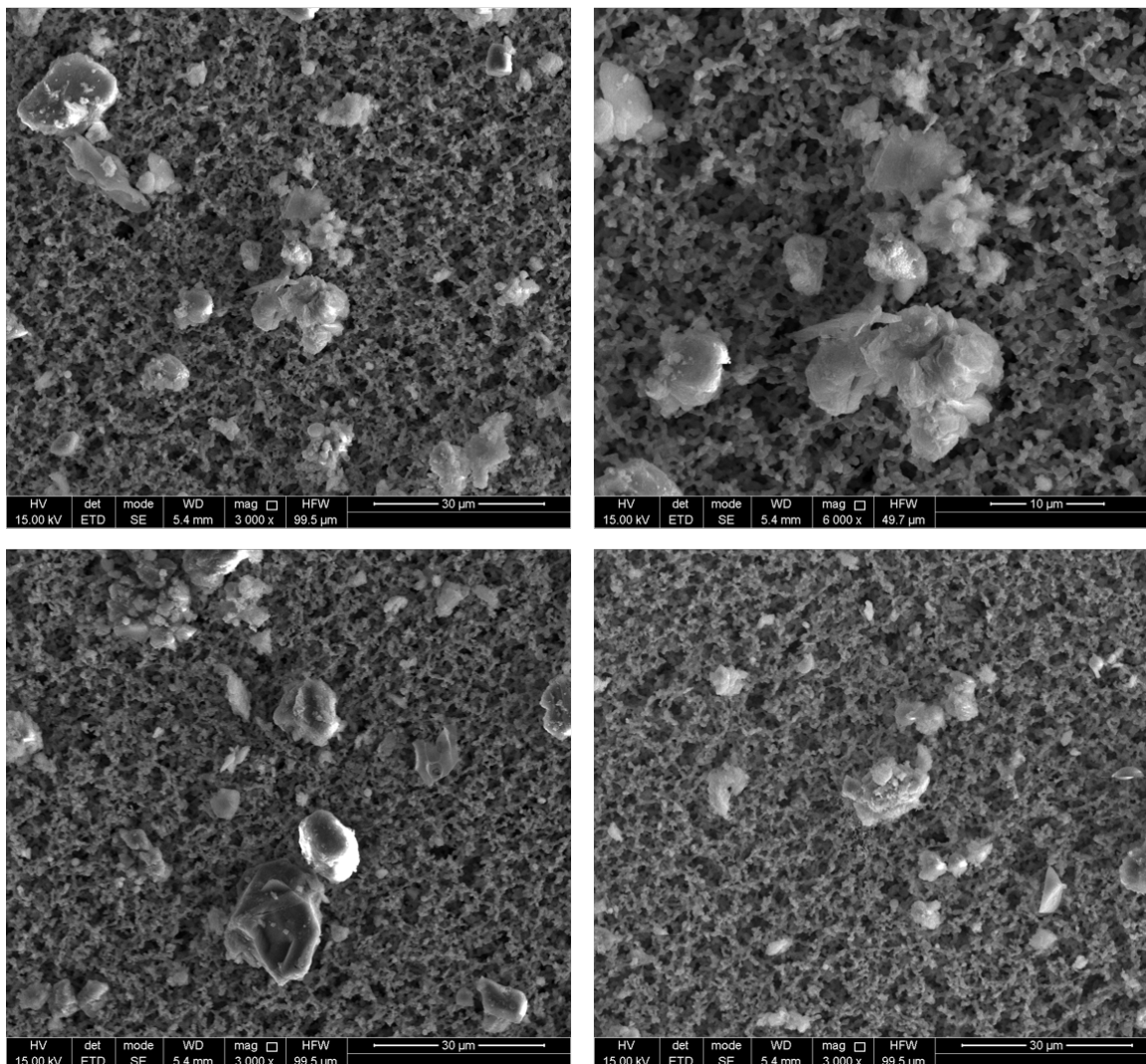


Figure 23. SEM-images with secondary electron detector of the sample “21-WB023 | 21.02.2020N-2”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. The chemical characterization of the particles is shown in Figure 23a.

Your reference: WB21_001
Our reference: 2103BR

21-WB023 | 21.02.2020N-2

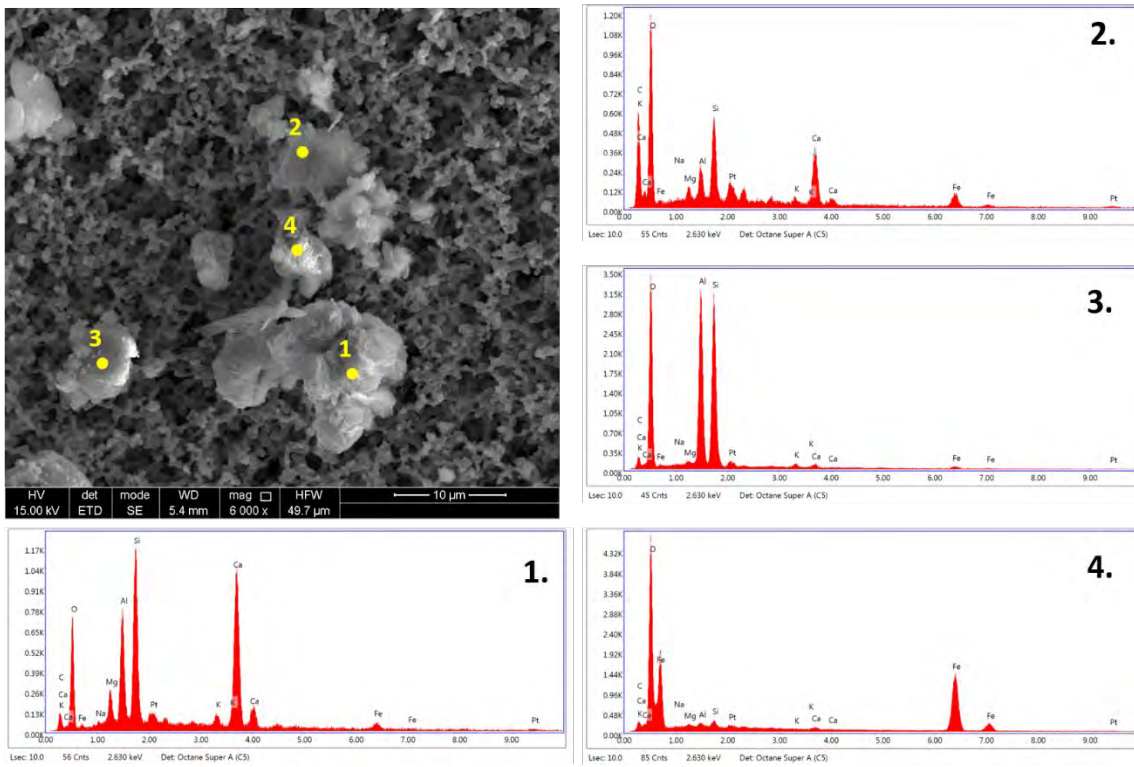


Figure 23a. EDX characterization of the particles identified in sample “21-WB023 | 21.02.2020N-2”.

Your reference: WB21_001

Our reference: 2103BR

18-02-2020 Portable Day Sampling (N-1)

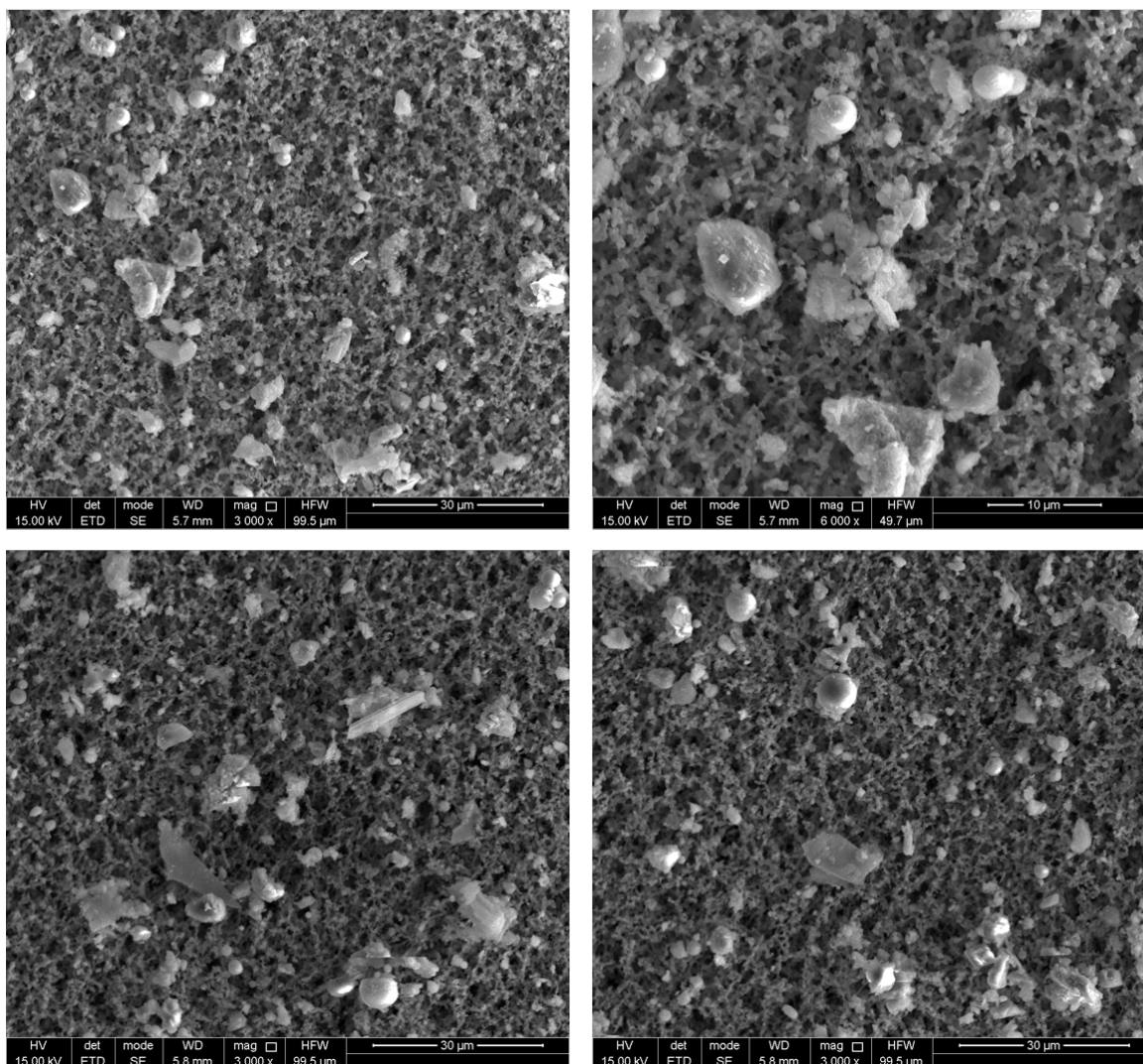


Figure 24. SEM-images with secondary electron detector of the sample “18-02-2020 Portable Day Sampling (N-1)”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. The chemical characterization of the particles is shown in Figure 24a.

Your reference: WB21_001
 Our reference: 2103BR

18-02-2020 Portable Day Sampling (N-1)

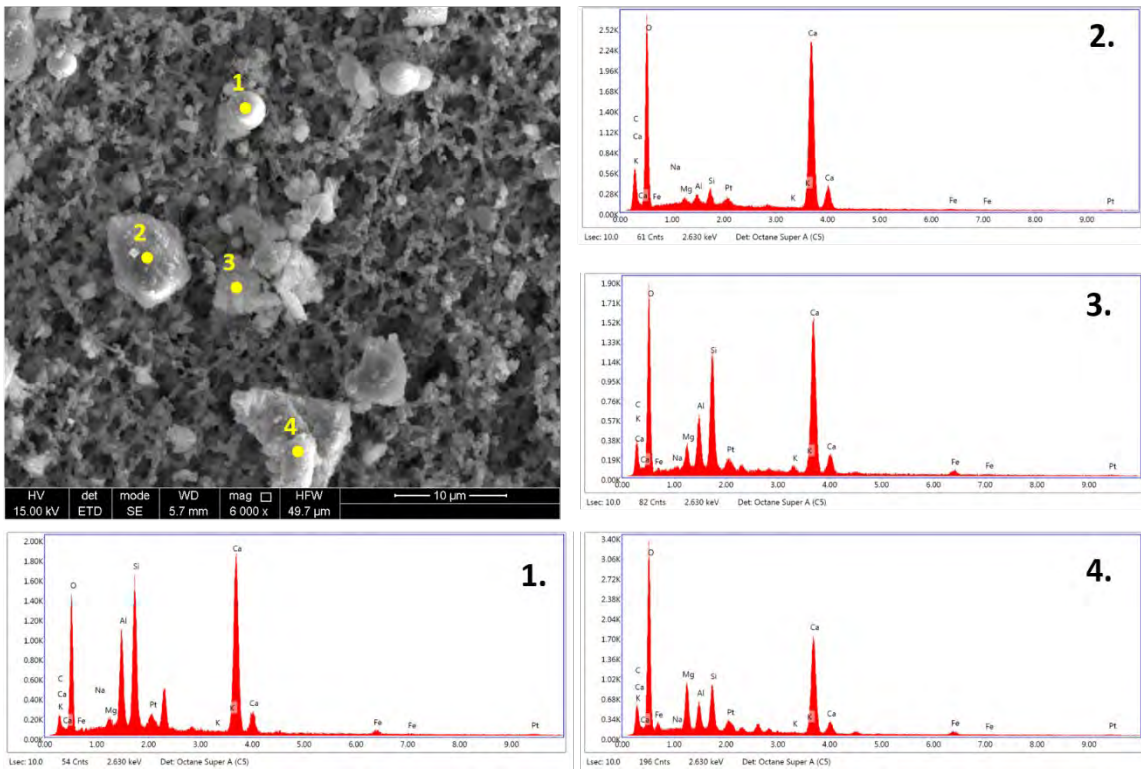


Figure 24a. EDX characterization of the particles identified in sample “18-02-2020 Portable Day Sampling (N-1)”.

Your reference: WB21_001

Our reference: 2103BR

22-02-2020 01

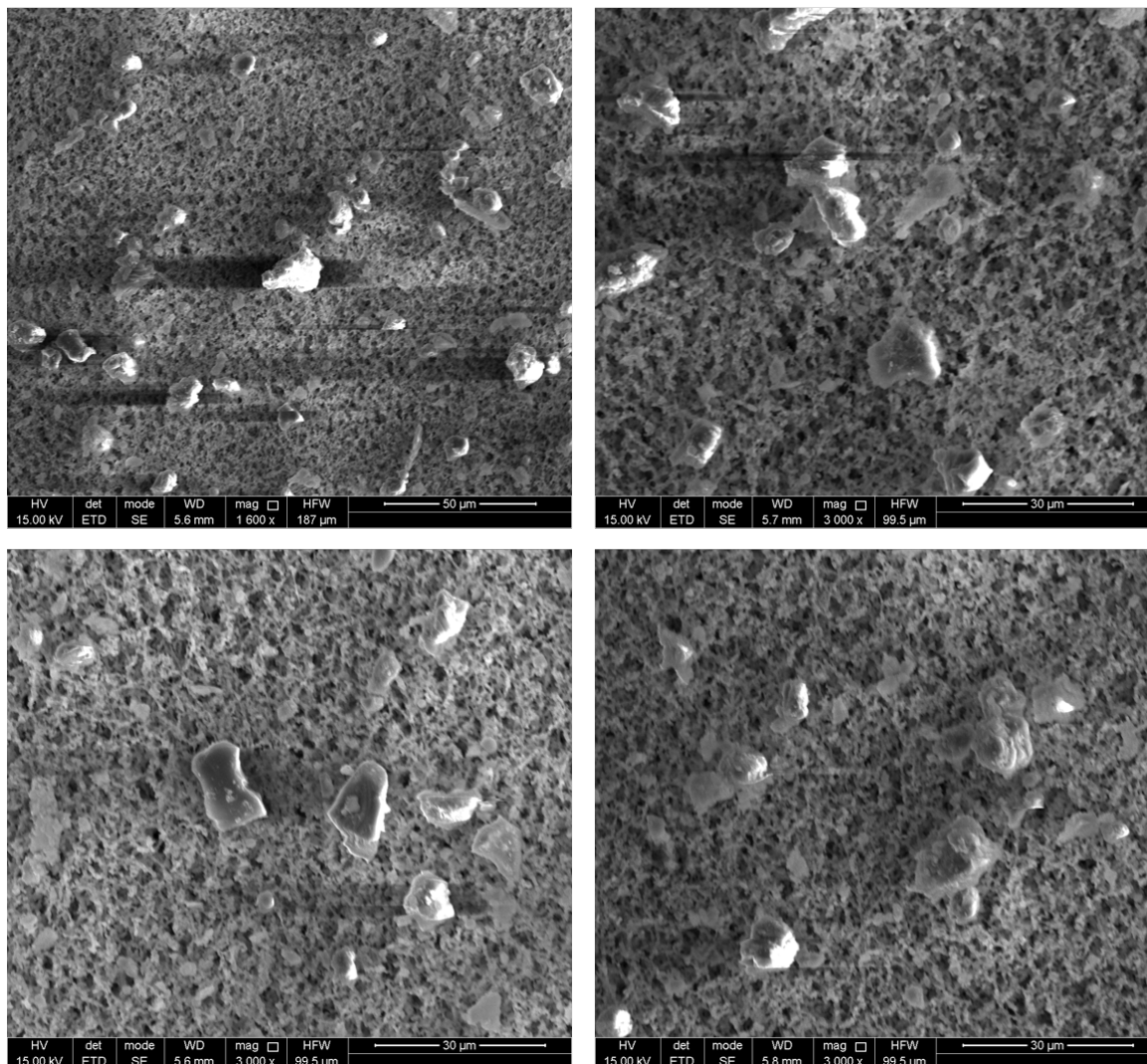


Figure 25. SEM-images with secondary electron detector of the sample “22-02-2020 01”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. The chemical characterization of the particles is shown in Figure 25a.

Your reference: WB21_001
 Our reference: 2103BR

22-02-2020 01

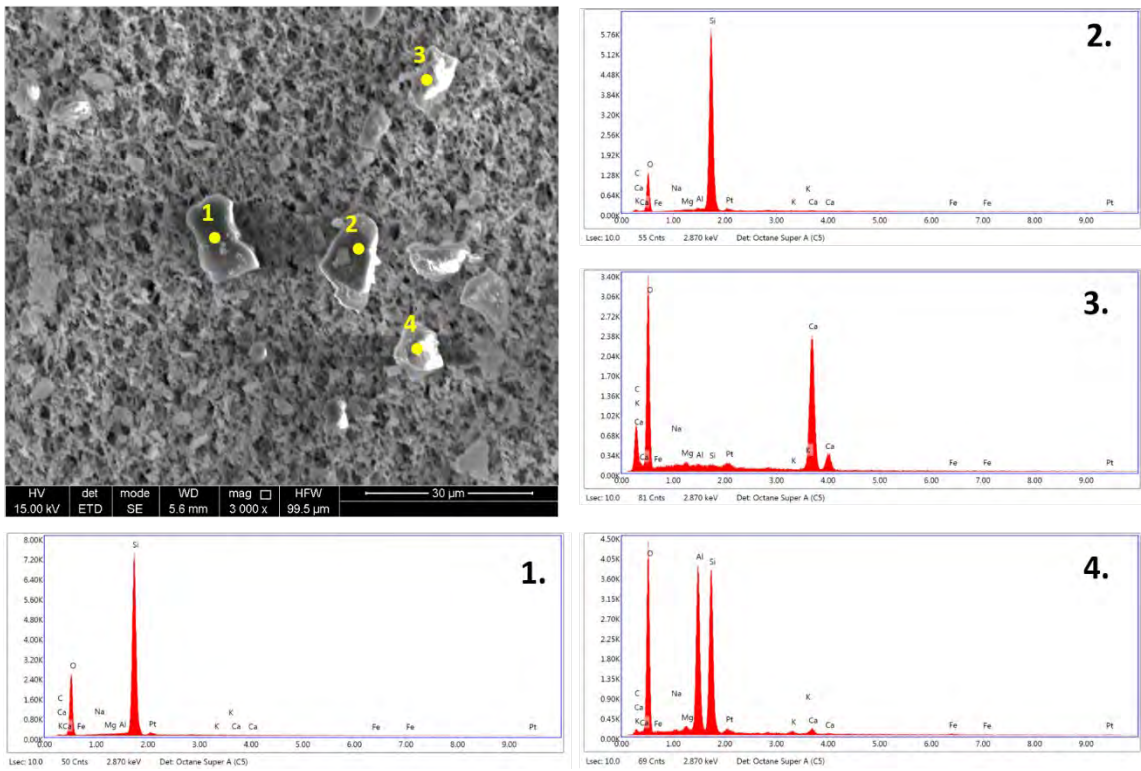


Figure 25a. EDX characterization of the particles identified in sample “22-02-2020 01”.

Your reference: WB21_001

Our reference: 2103BR

22-02-2020 03

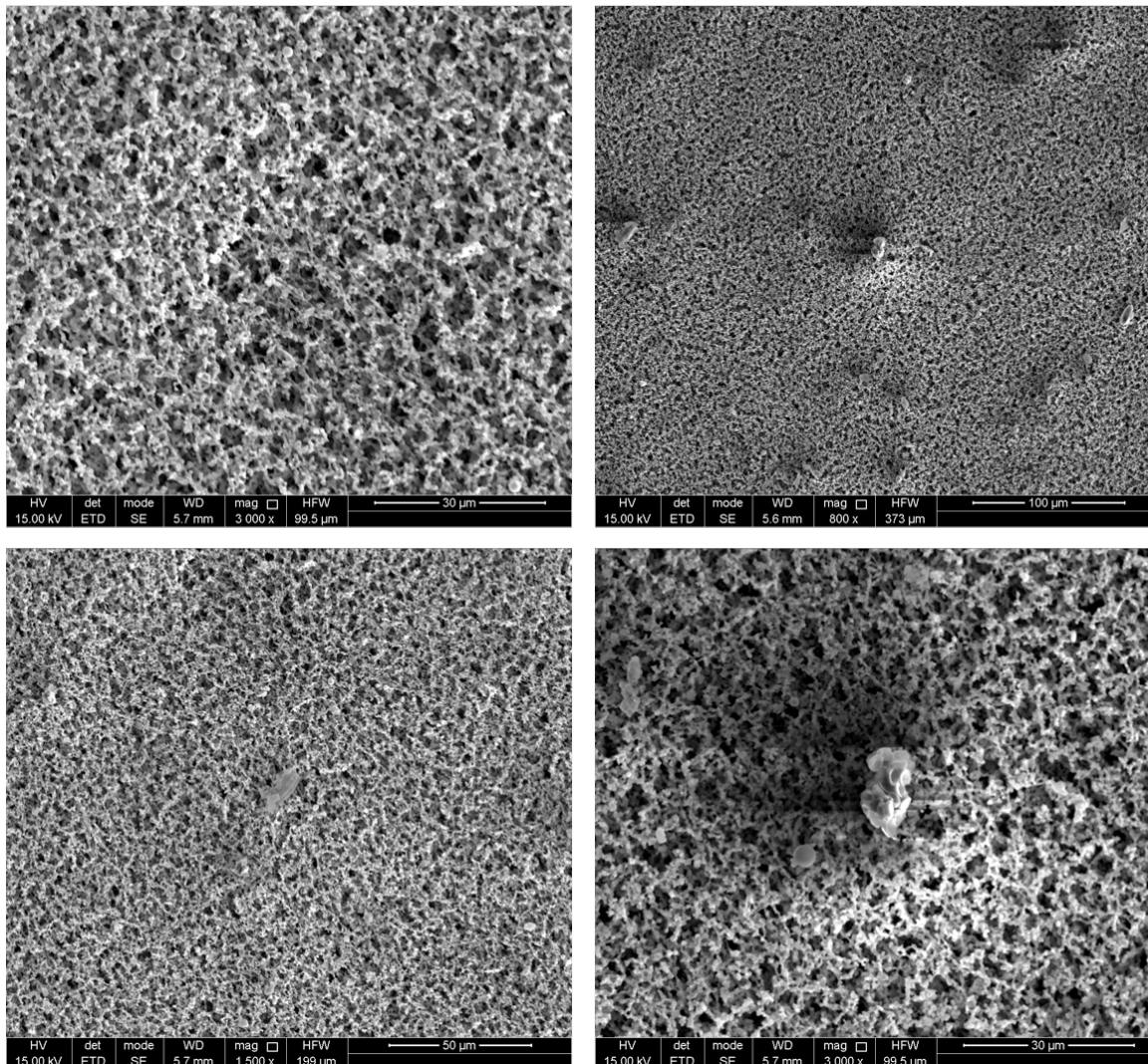


Figure 26. SEM-images with secondary electron detector of the sample “22-02-2020 03”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. The chemical characterization of the particles is shown in Figure 26a.

Your reference: WB21_001
Our reference: 2103BR

22-02-2020 03

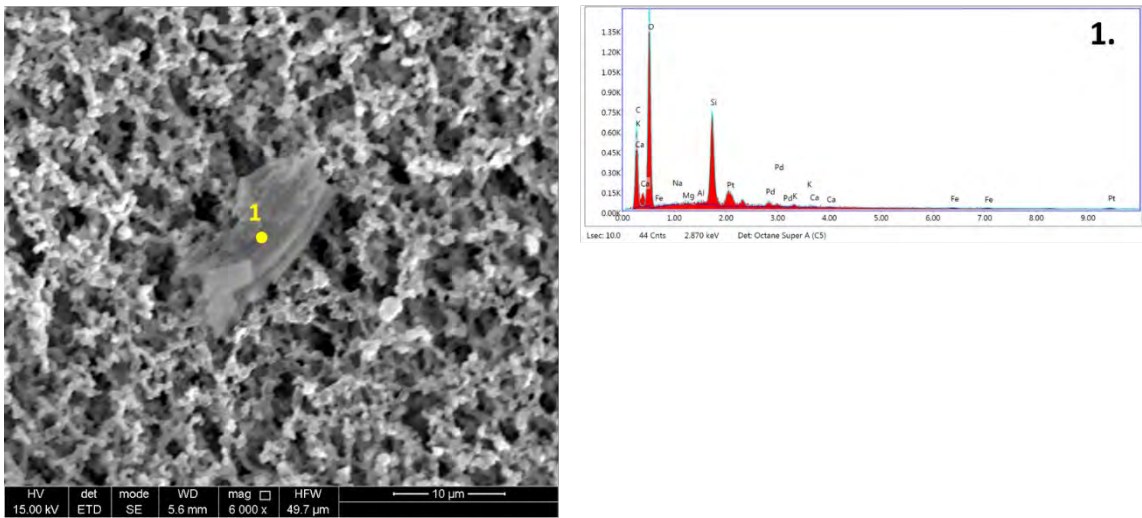


Figure 26a. EDX characterization of the particles identified in sample “22-02-2020 03”.

Your reference: WB21_001

Our reference: 2103BR

22-02-2020 (0-4)

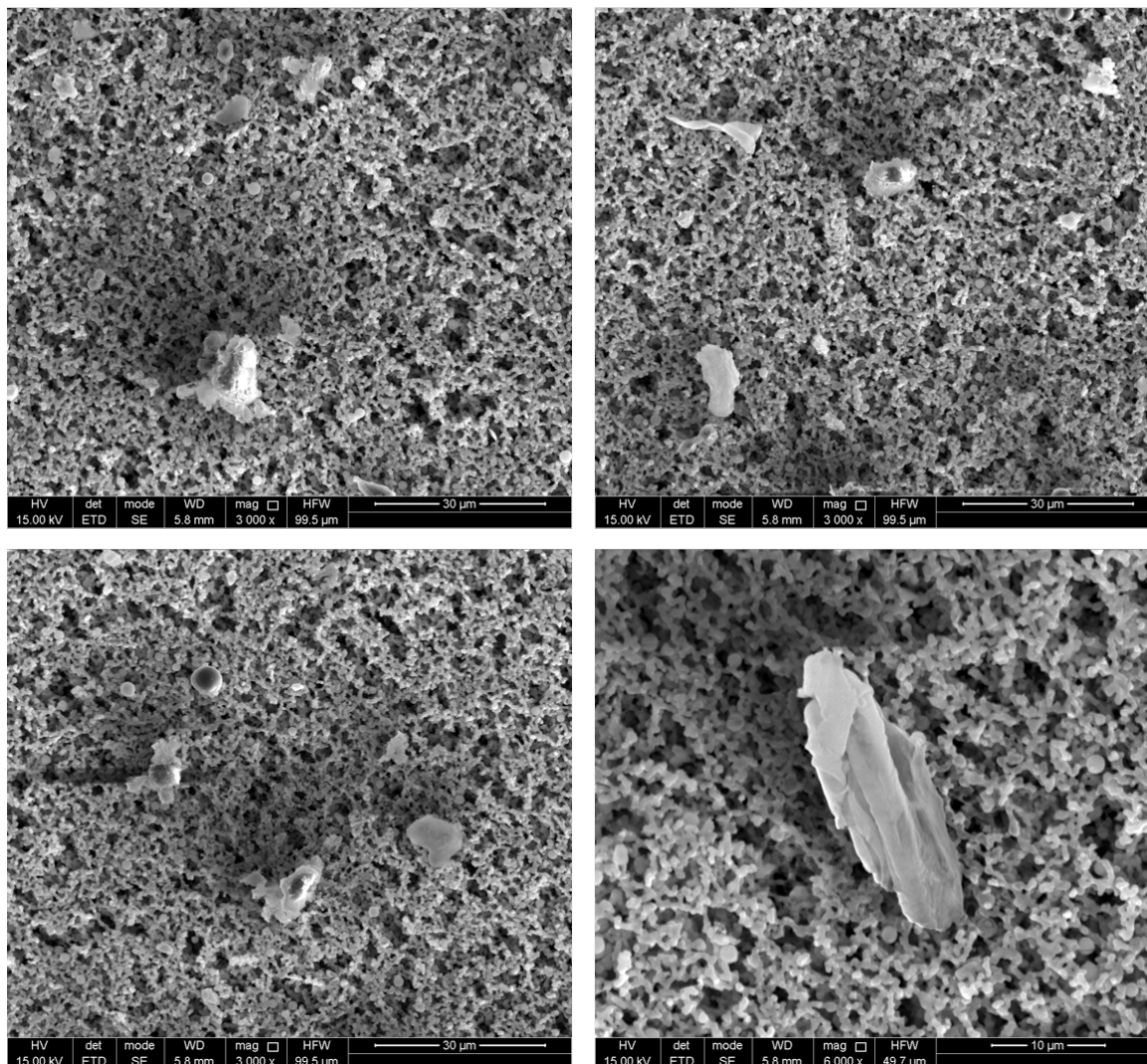


Figure 27. SEM-images with secondary electron detector of the sample “22-02-2020 (0-4)”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. The chemical characterization of the particles is shown in Figure 27a.

Your reference: WB21_001
Our reference: 2103BR

22-02-2020 (0-4)

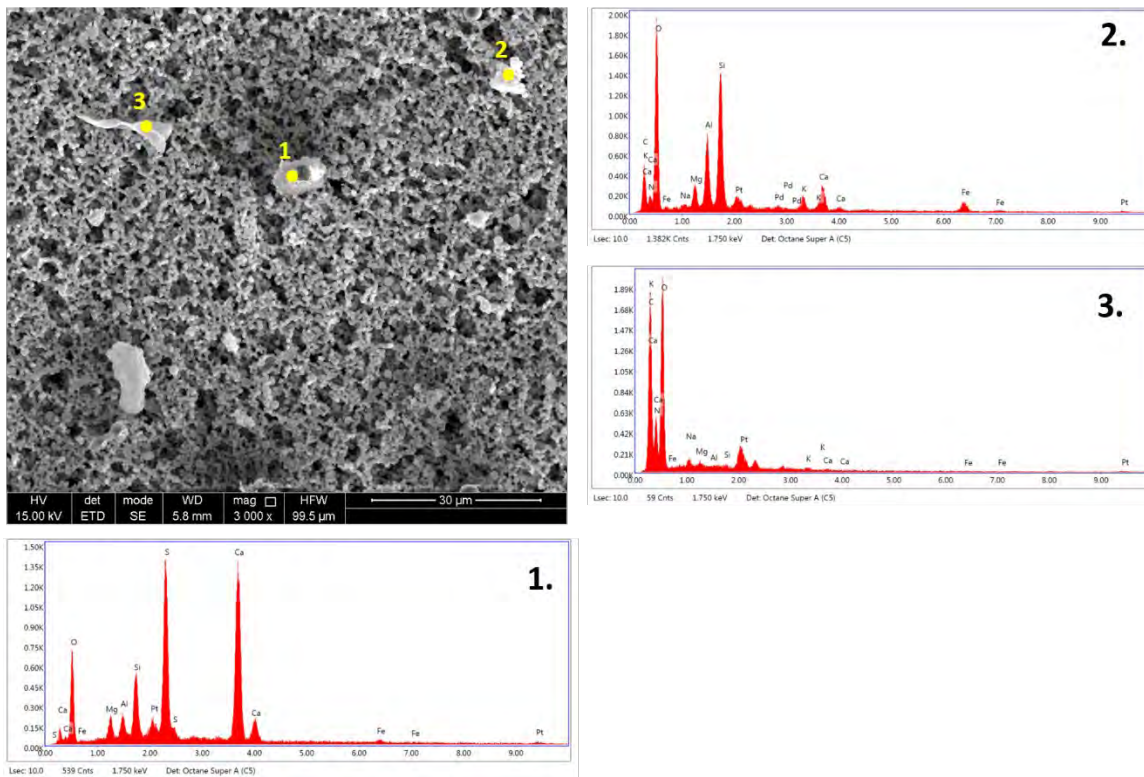


Figure 27a. EDX characterization of the particles identified in sample “22-02-2020 (0-4)”.

Your reference: WB21_001

Our reference: 2103BR

22-02-2020 0-5

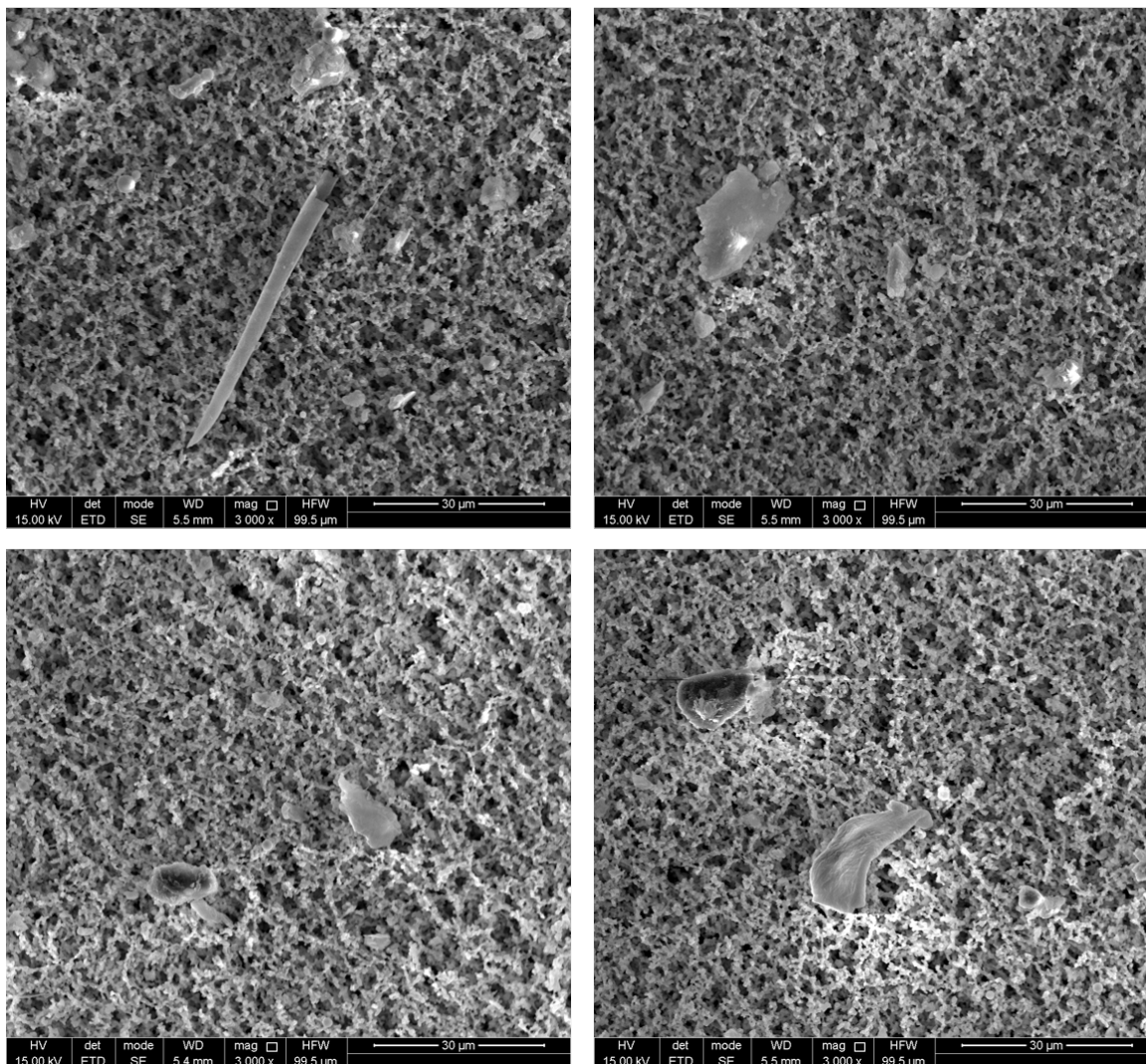


Figure 28. SEM-images with secondary electron detector of the sample “22-02-2020 0-5”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. One single fibre structure was observed in this sample but the fibre has no asbestos appearance. The chemical characterization of the particles is shown in Figure 28a.

Your reference: WB21_001
 Our reference: 2103BR

22-02-2020 0-5

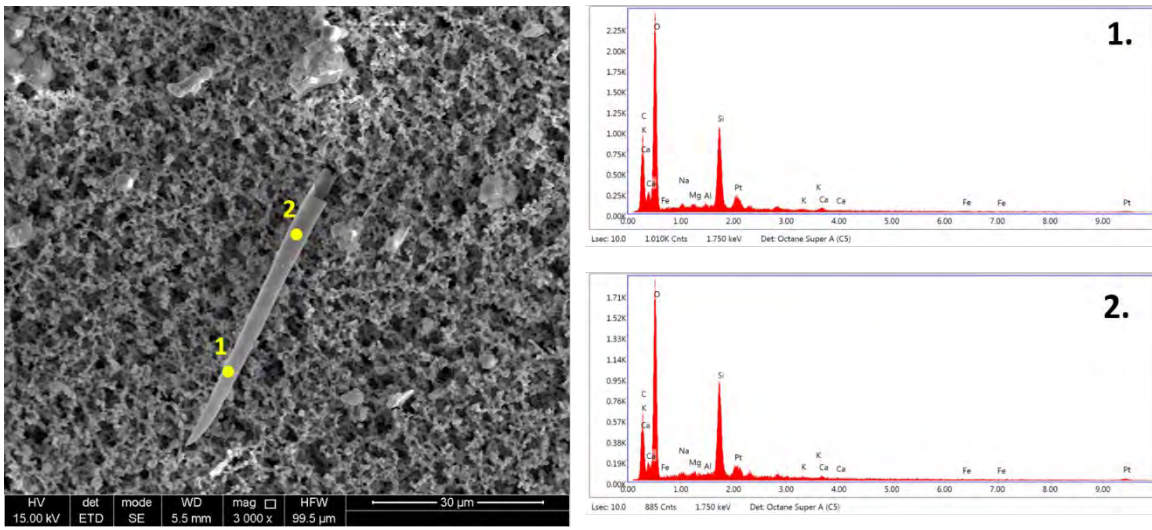


Figure 28a. EDX characterization of the particles identified in sample “22-02-2020 0-5”.

Your reference: WB21_001

Our reference: 2103BR

22-02-2020 (N1)

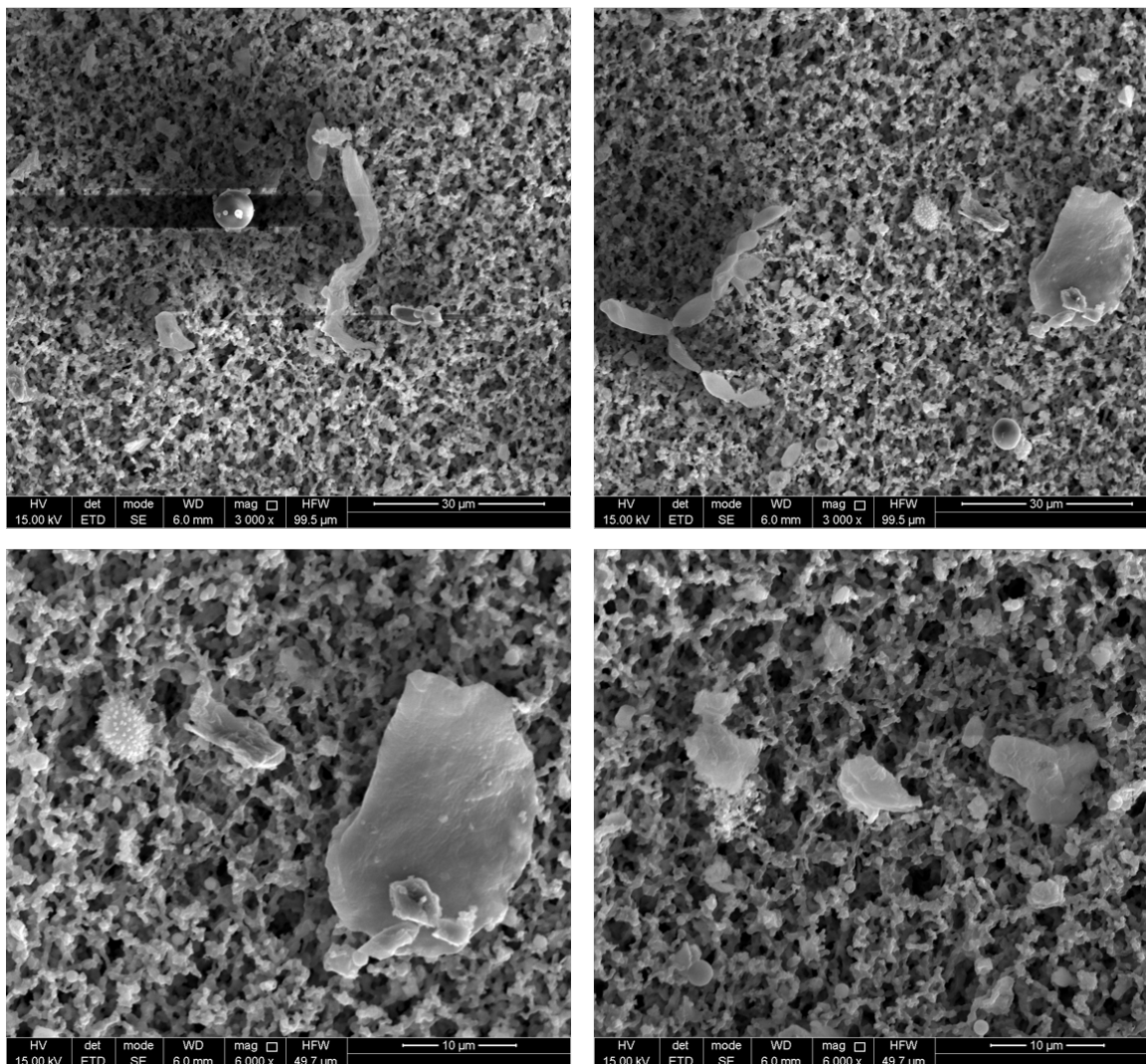


Figure 29. SEM-images with secondary electron detector of the sample “22-02-2020 (N1)”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. One single fibre structure was observed in this sample but the fibre has no asbestos appearance. The chemical characterization of the particles is shown in Figure 29a.

Your reference: WB21_001
 Our reference: 2103BR

22-02-2020 (N1)

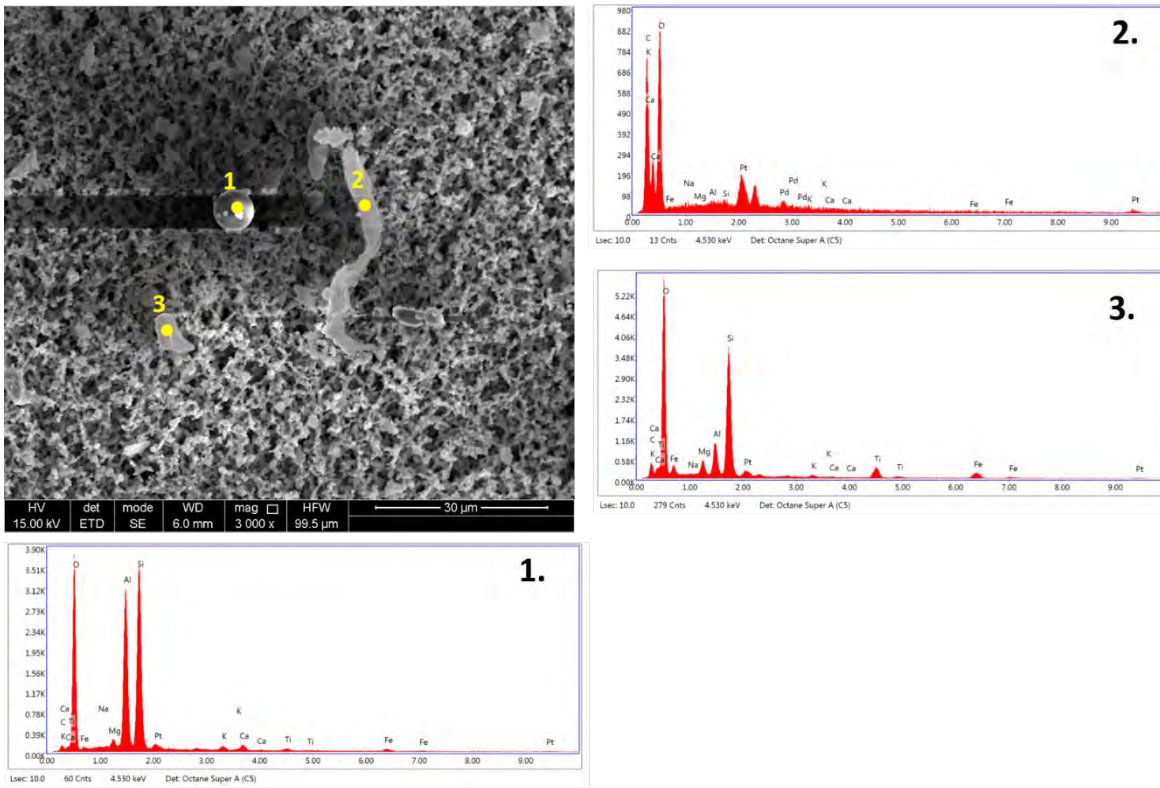


Figure 29a. EDX characterization of the particles identified in sample “22-02-2020 (N1)”.

Your reference: WB21_001

Our reference: 2103BR

22-02-2020 N1

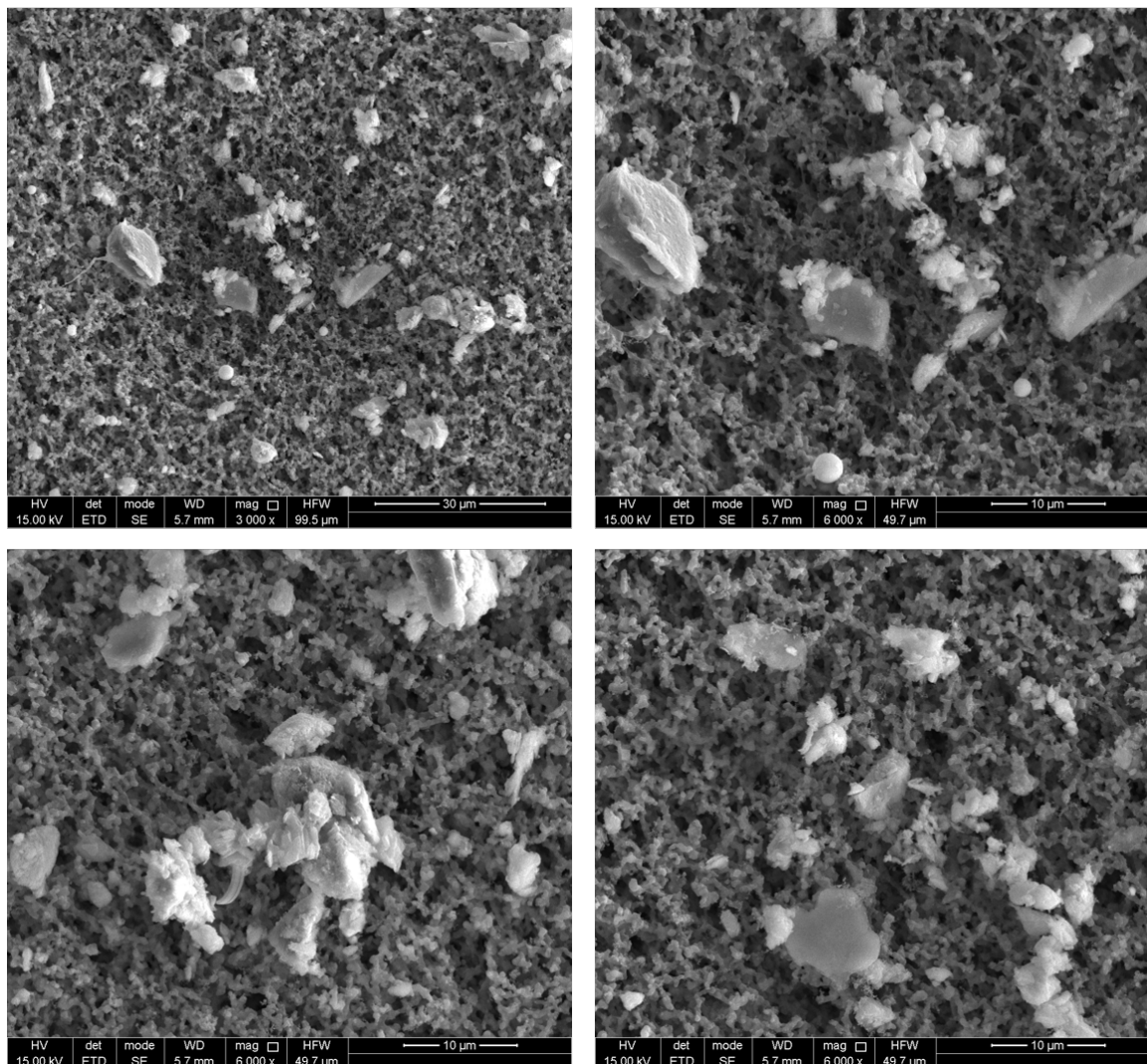


Figure 30. SEM-images with secondary electron detector of the sample “22-02-2020 N1”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface. The chemical characterization of the particles is shown in Figure 30a.

Your reference: WB21_001
 Our reference: 2103BR

22-02-2020 N1

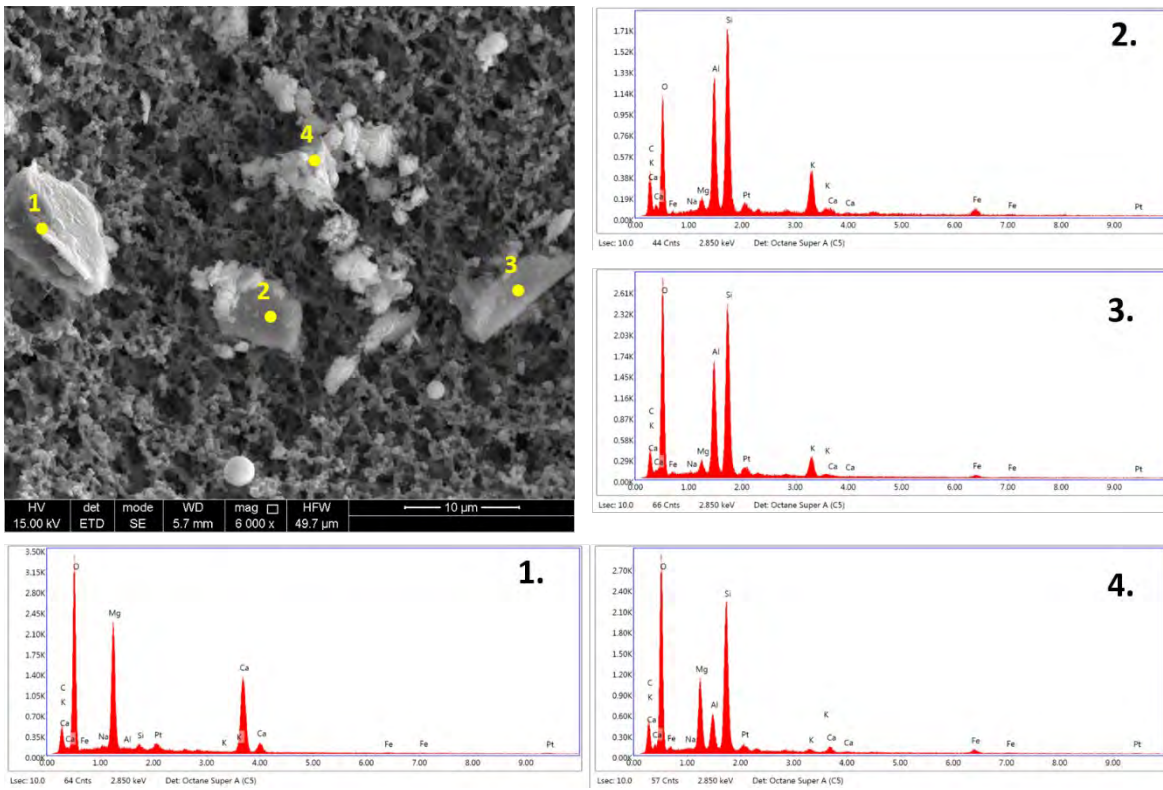


Figure 30a. EDX characterization of the particles identified in sample “22-02-2020 N1”.

Your reference: WB21_001

Our reference: 2103BR

18-02-2020 F Blank

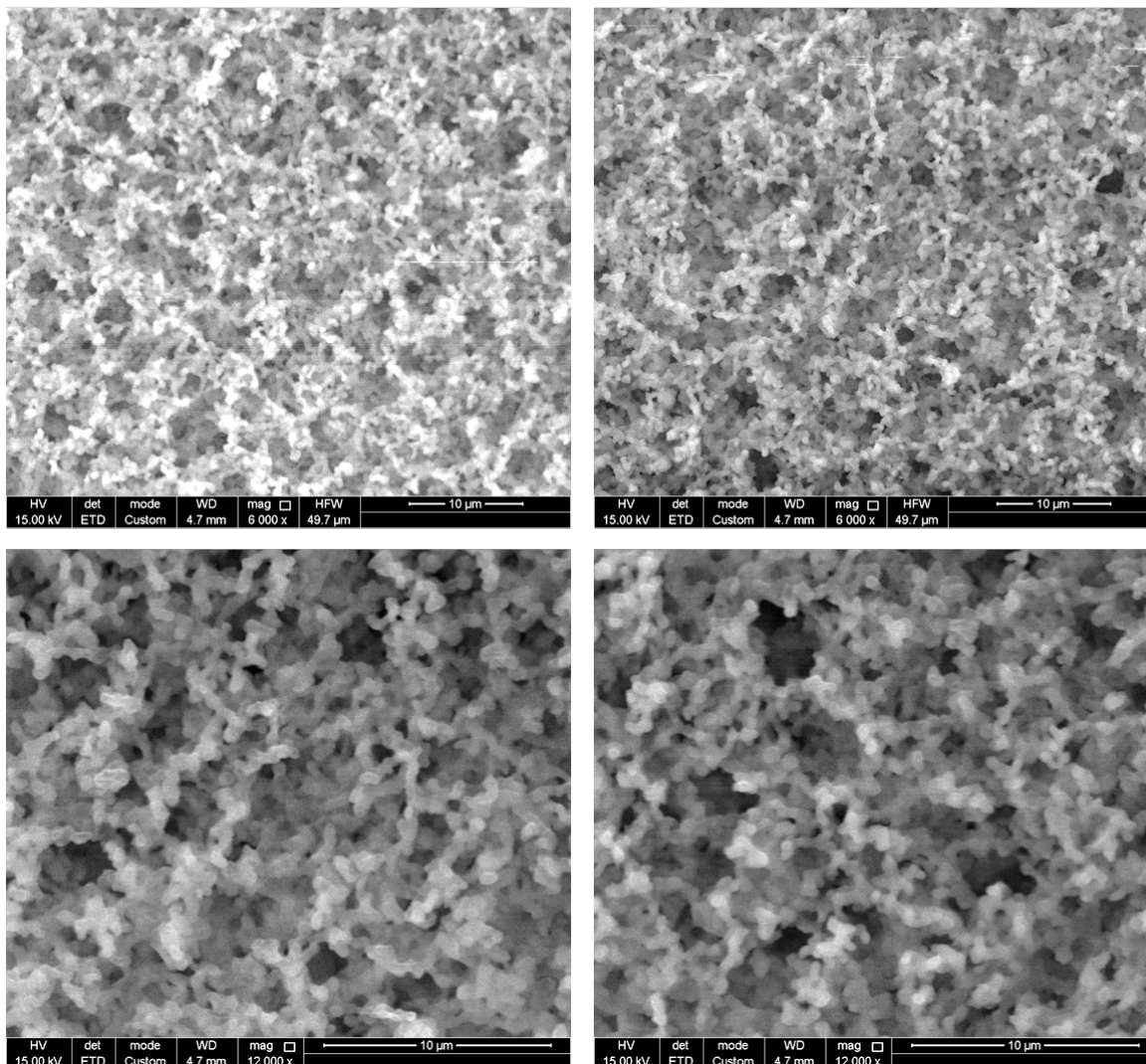


Figure 31. SEM-images with secondary electron detector of the blank sample “18-02-2020 F Blank”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface.

Your reference: WB21_001

Our reference: 2103BR

18-02-2020 F Blank (0-1)

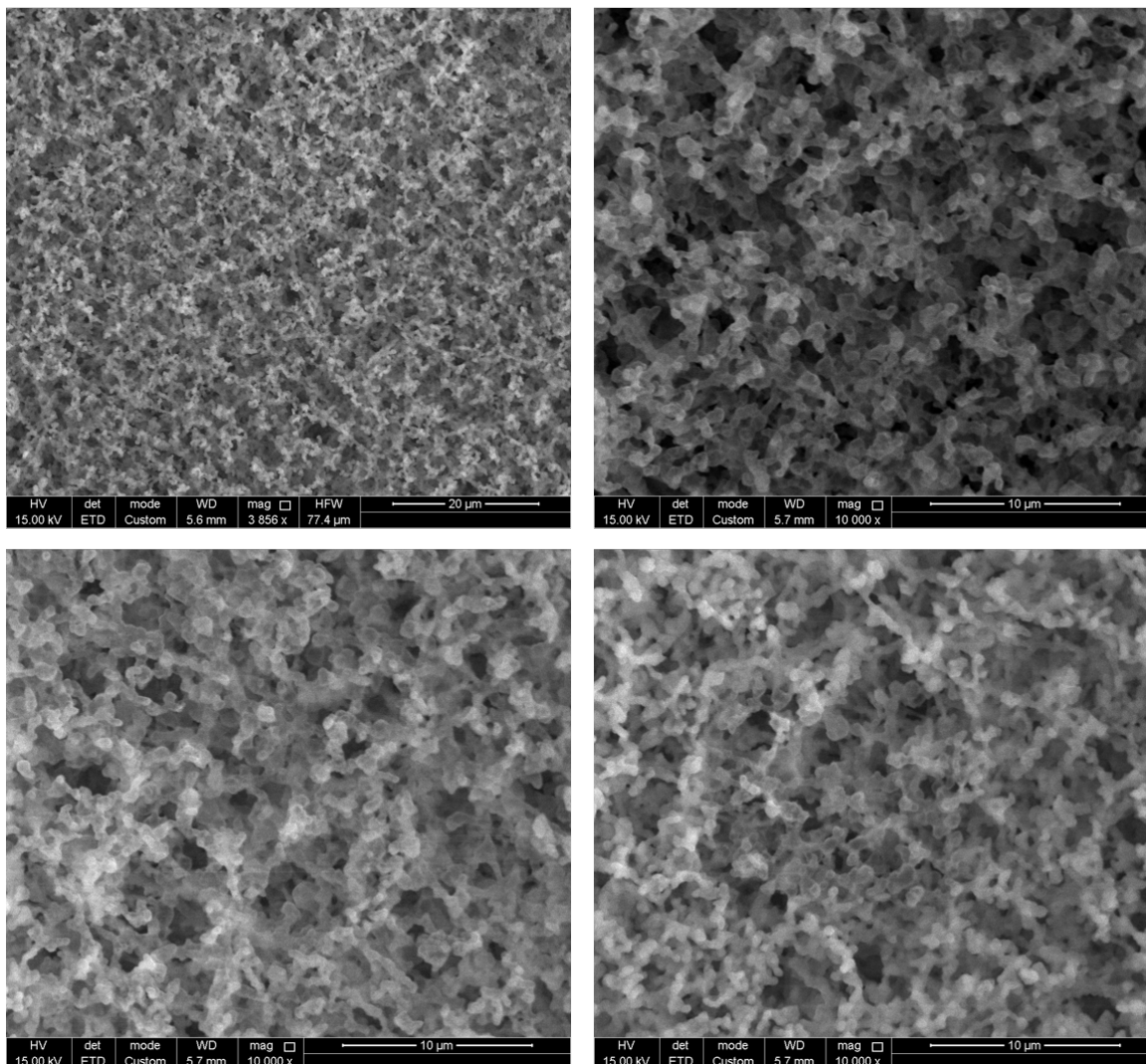


Figure 32. SEM-images with secondary electron detector of the blank sample “18-02-2020 F Blank (0-1)”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface.

Your reference: WB21_001

Our reference: 2103BR

18-02-2020 Calibration Kymore

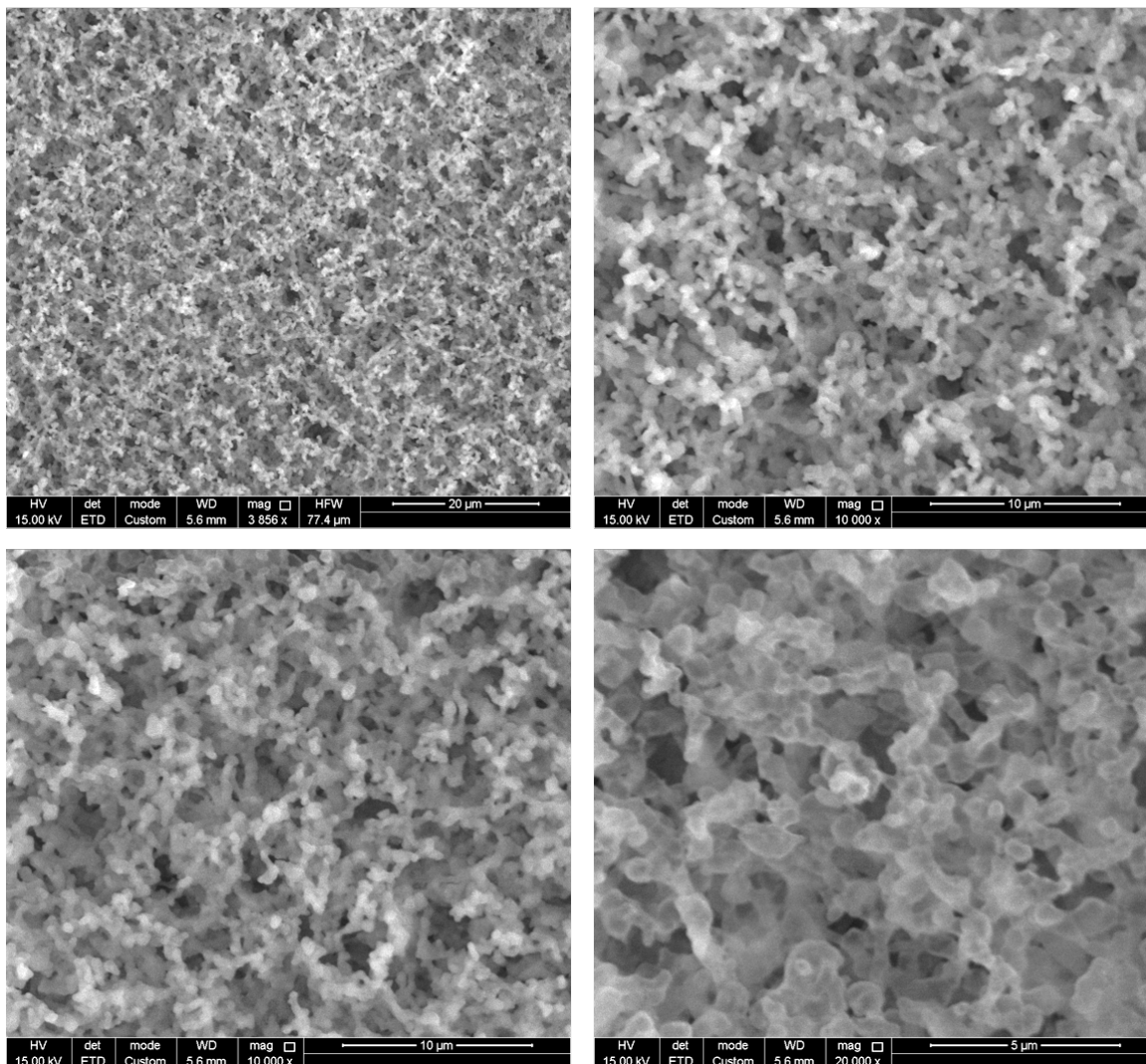


Figure 33. SEM-images with secondary electron detector of the blank sample “18-02-2020 Calibration Kymore”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface.

Your reference: WB21_001

Our reference: 2103BR

FB-19-2020 Calibration Kymore

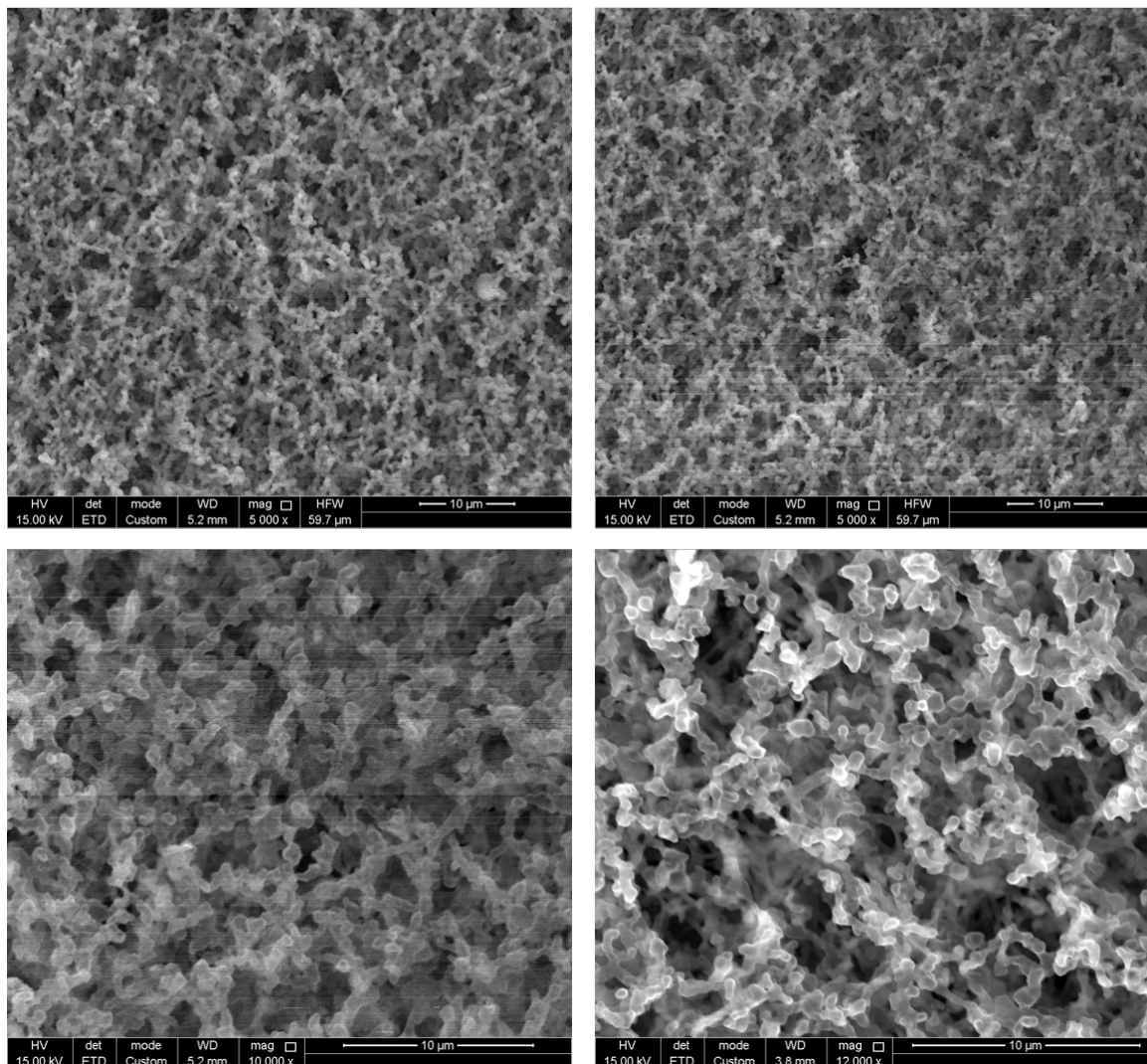


Figure 34. SEM-images with secondary electron detector of the blank sample “FB-19-2020 Calibration Kymore”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface.

Your reference: WB21_001

Our reference: 2103BR

FB-19-02-20

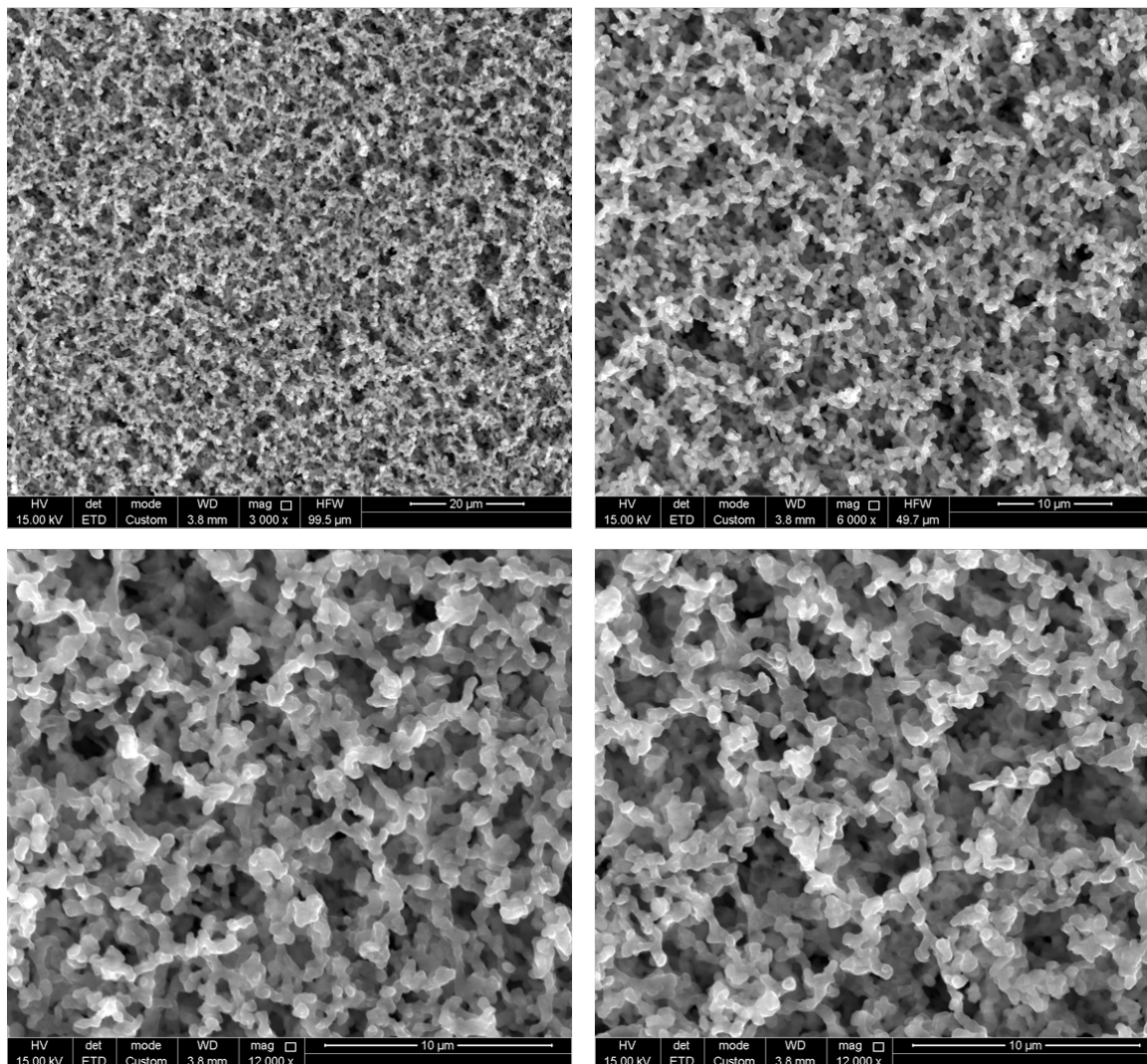


Figure 35. SEM-images with secondary electron detector of the blank sample “FB-19-02-20”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface.

Your reference: WB21_001

Our reference: 2103BR

20.02.2020 FB (VIJAYLAL)

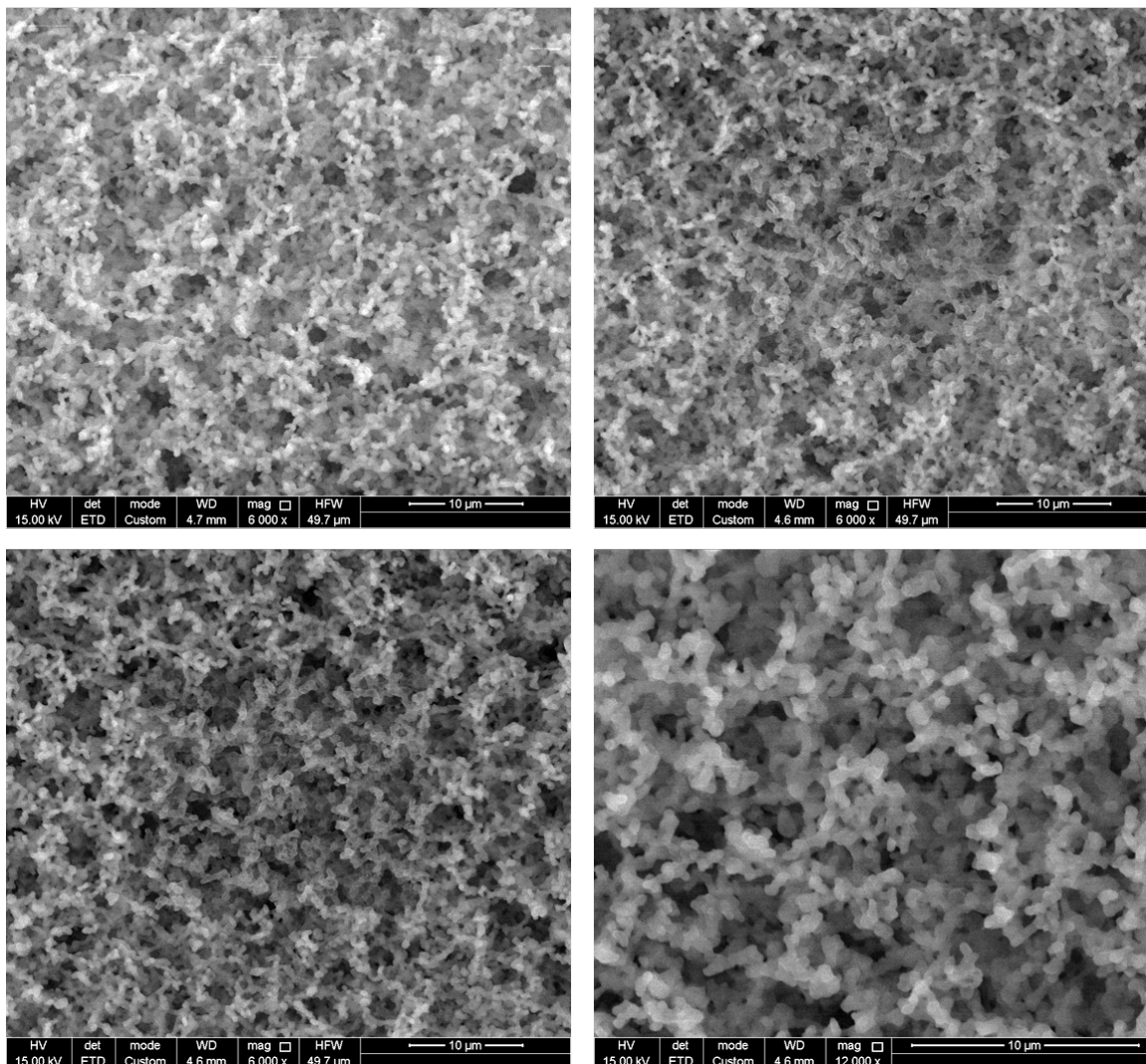


Figure 36. SEM-images with secondary electron detector of the blank sample “20.02.2020 FB (VIJAYLAL)”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface.

Your reference: WB21_001

Our reference: 2103BR

20.02.2020 Cal Kymore

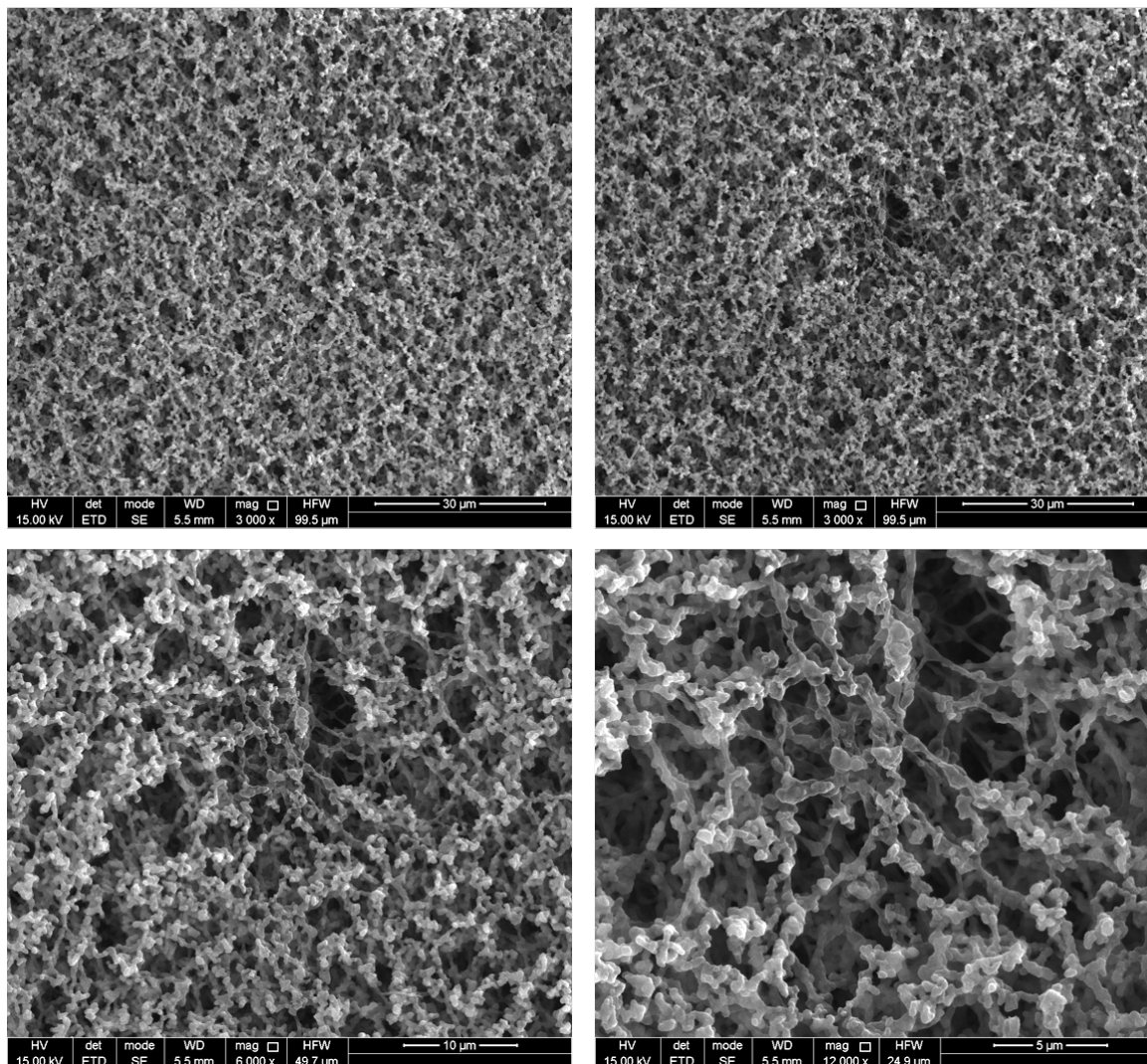


Figure 37. SEM-images with secondary electron detector of the blank sample “20.02.2020 Cal Kymore”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface.

Your reference: WB21_001

Our reference: 2103BR

20.02.2020 FB

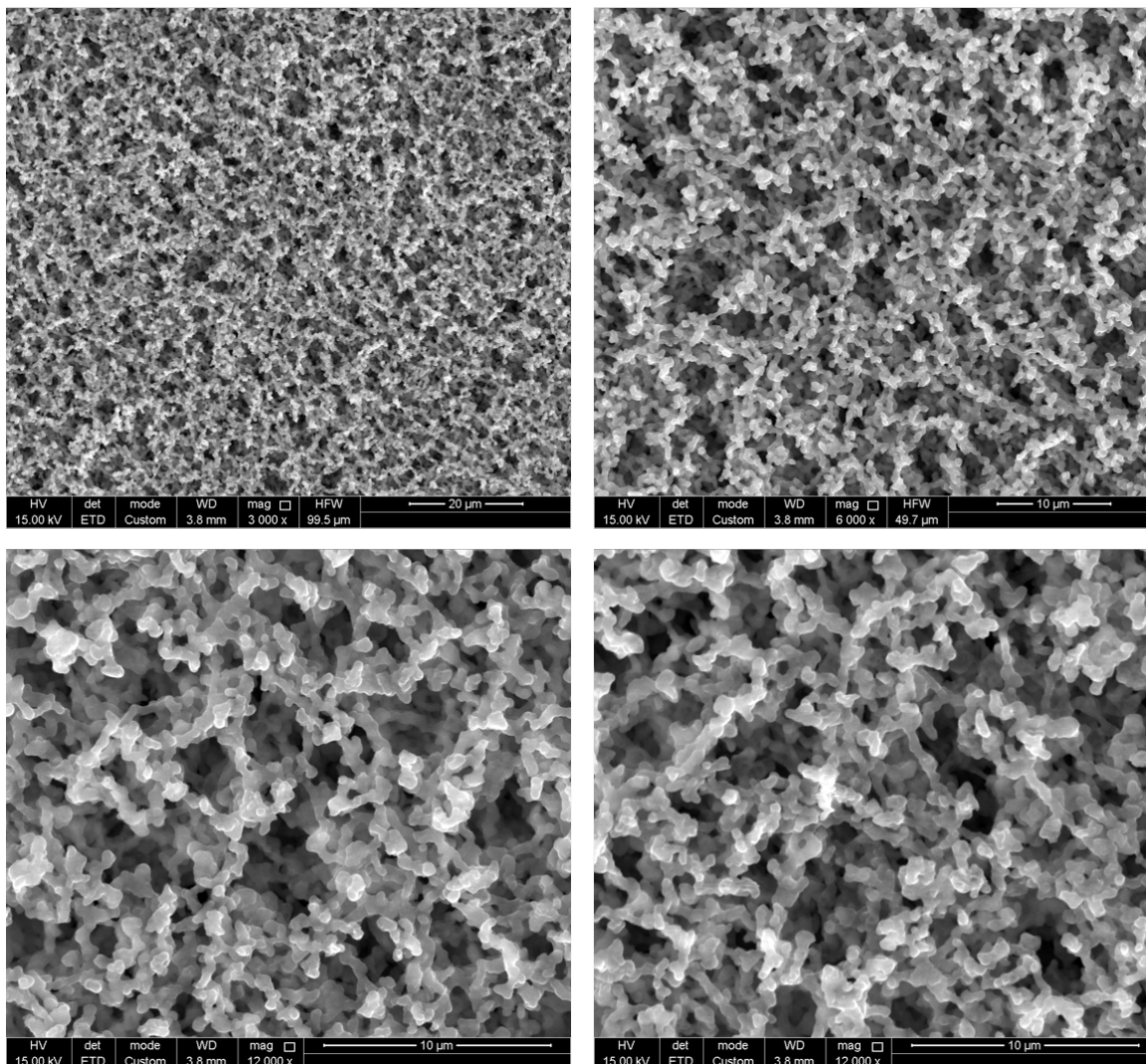


Figure 38. SEM-images with secondary electron detector of the blank sample “20.02.2020 FB”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface.

Your reference: WB21_001

Our reference: 2103BR

21-02-2020 Cal Kymore

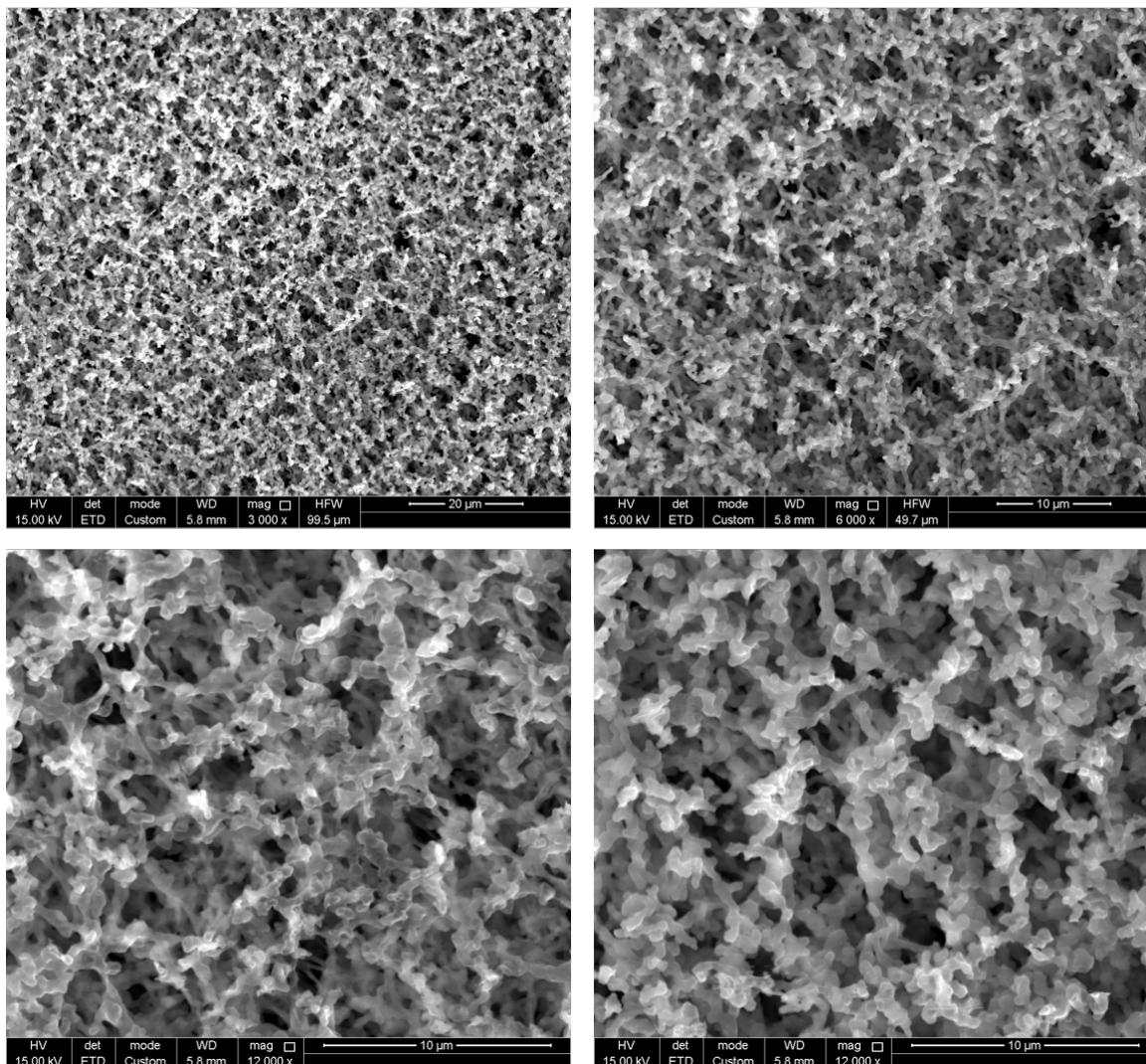


Figure 39. SEM-images with secondary electron detector of the blank sample “21-02-2020 Cal Kymore”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface.

Your reference: WB21_001

Our reference: 2103BR

21-02-2020 FB Ravi

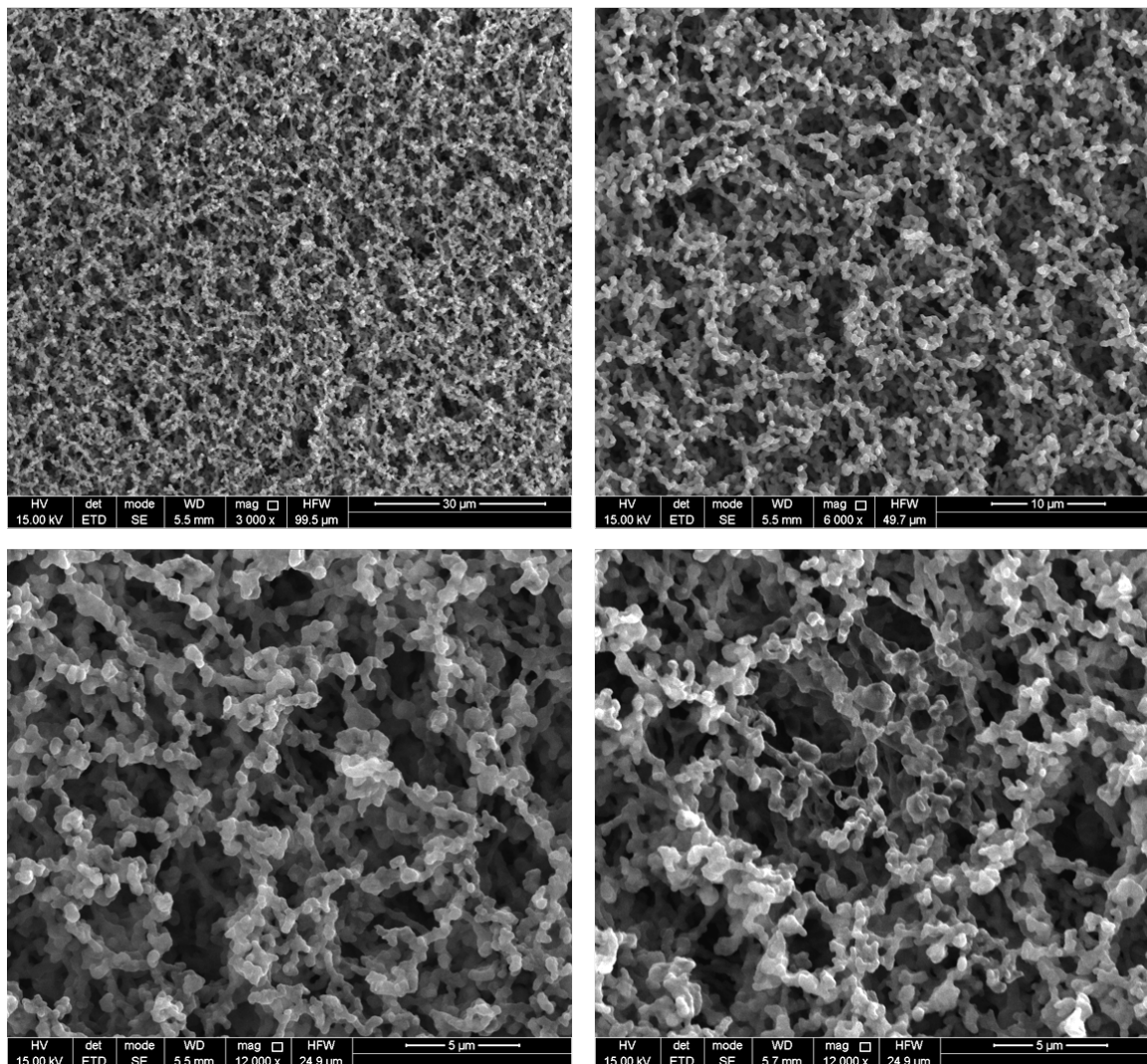


Figure 40. SEM-images with secondary electron detector of the blank sample “21-02-2020 FB Ravi”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface.

Your reference: WB21_001

Our reference: 2103BR

22-02-2020 FB

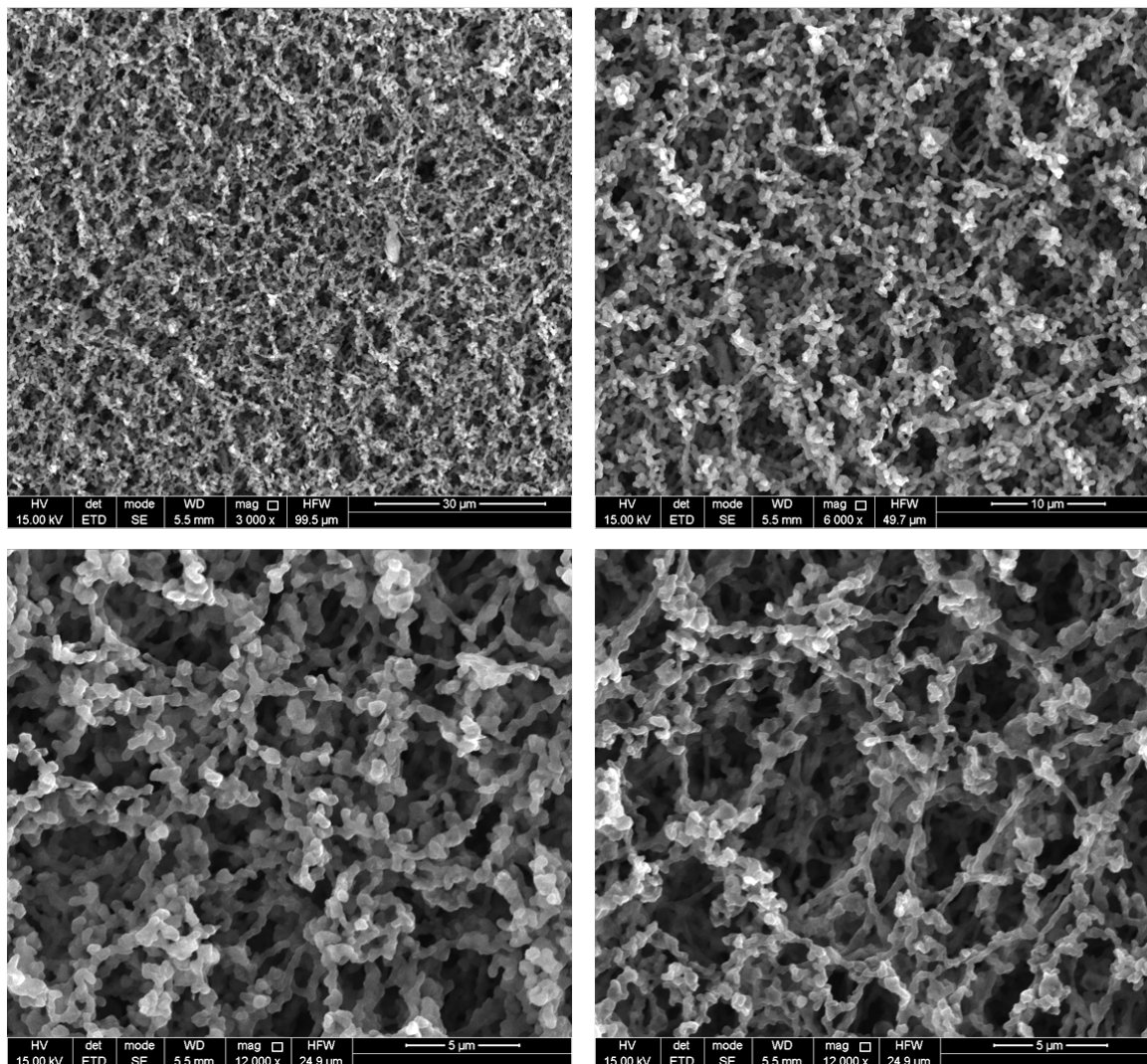


Figure 41. SEM-images with secondary electron detector of the blank sample “22-02-2020 FB”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface.

Your reference: WB21_001
Our reference: 2103BR

22-02-2020 CLALI Kymore

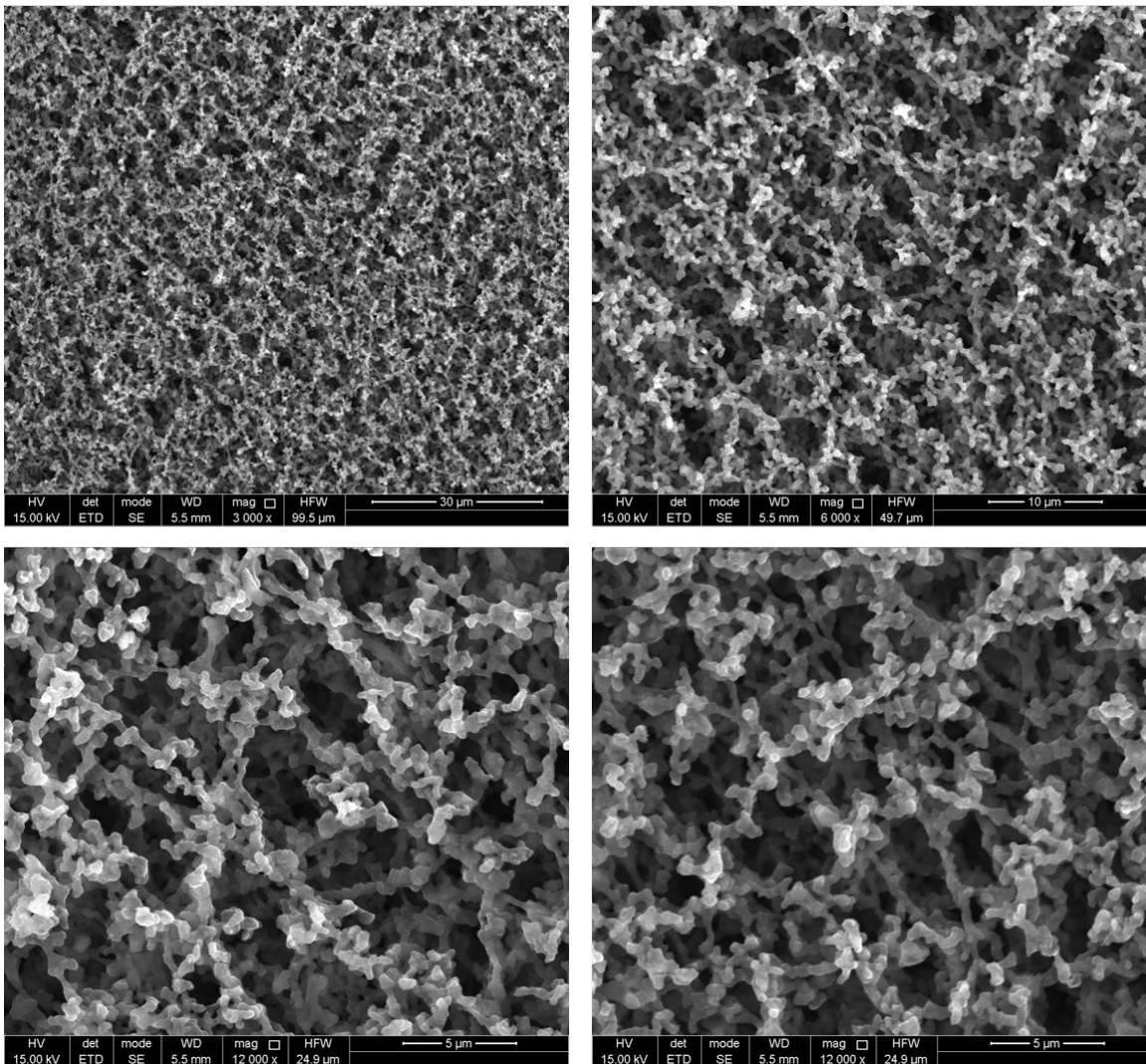


Figure 42. SEM-images with secondary electron detector of the blank sample “22-02-2020 CLALI Kymore”. The images show the network of the pvc filter using different magnifications with several multiple particles on the surface.