

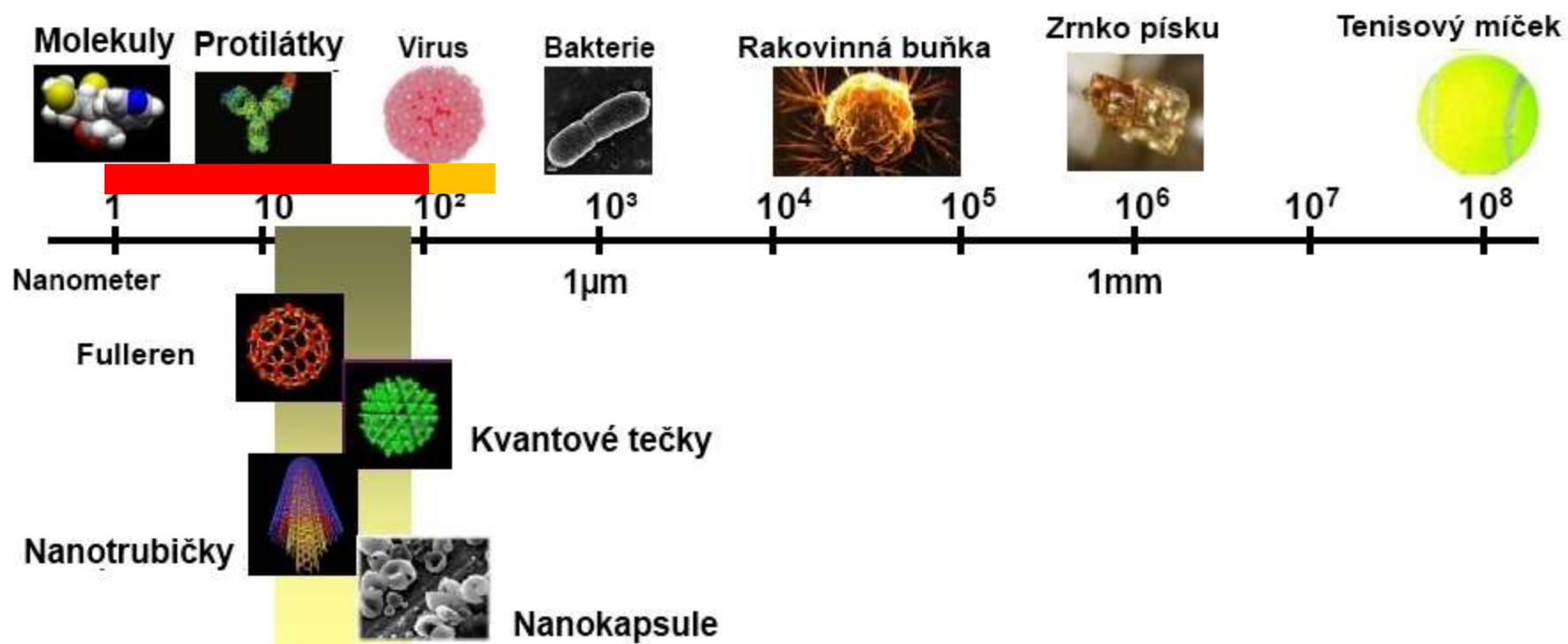


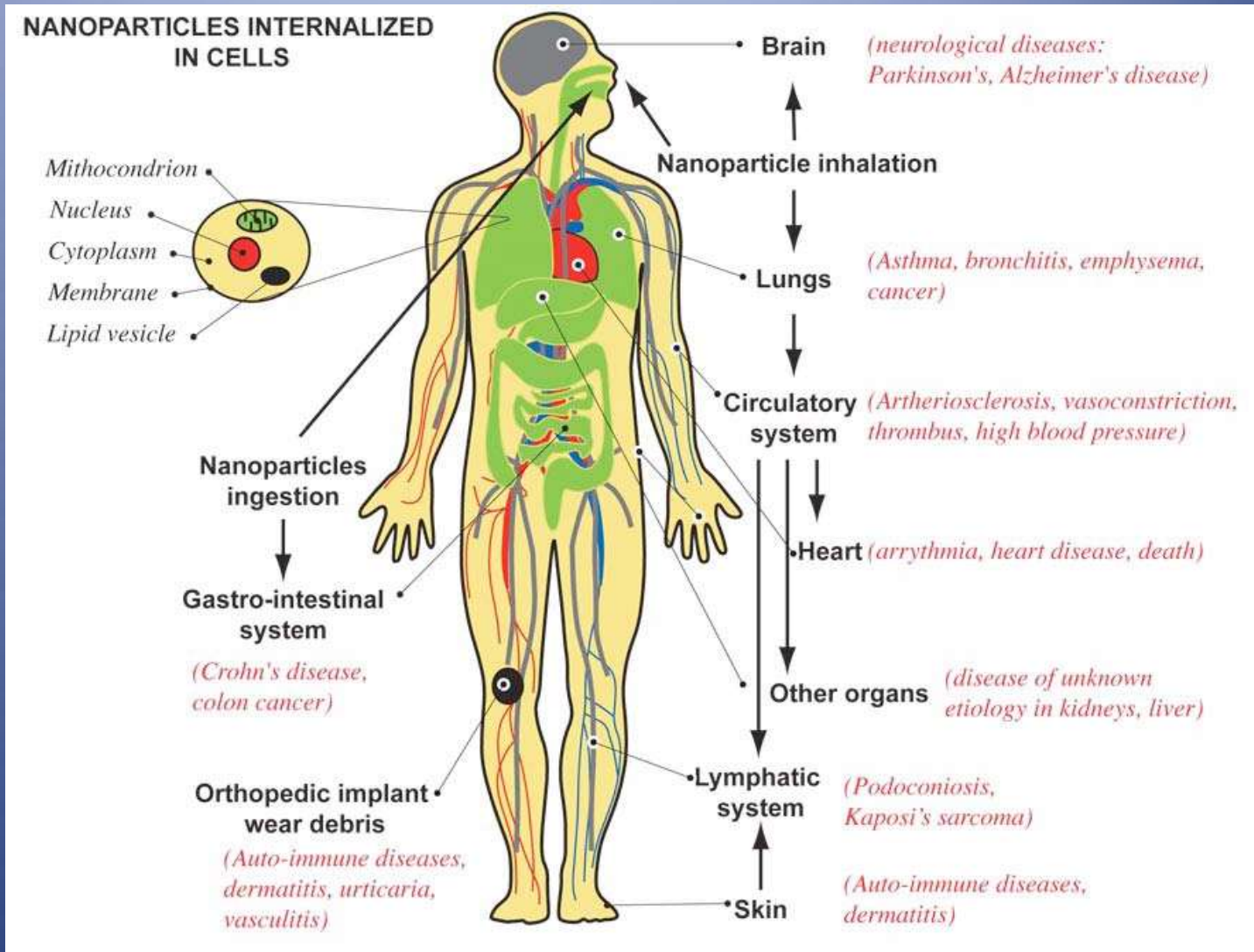
ZKUŠENOSTI S MĚŘENÍM NANOČÁSTIC VE VENKOVNÍM A PRACOVNÍM PROSTŘEDÍ.

Karel Lach¹, Vladimír Mička¹, Petr Skřehot²



Velikostní škála

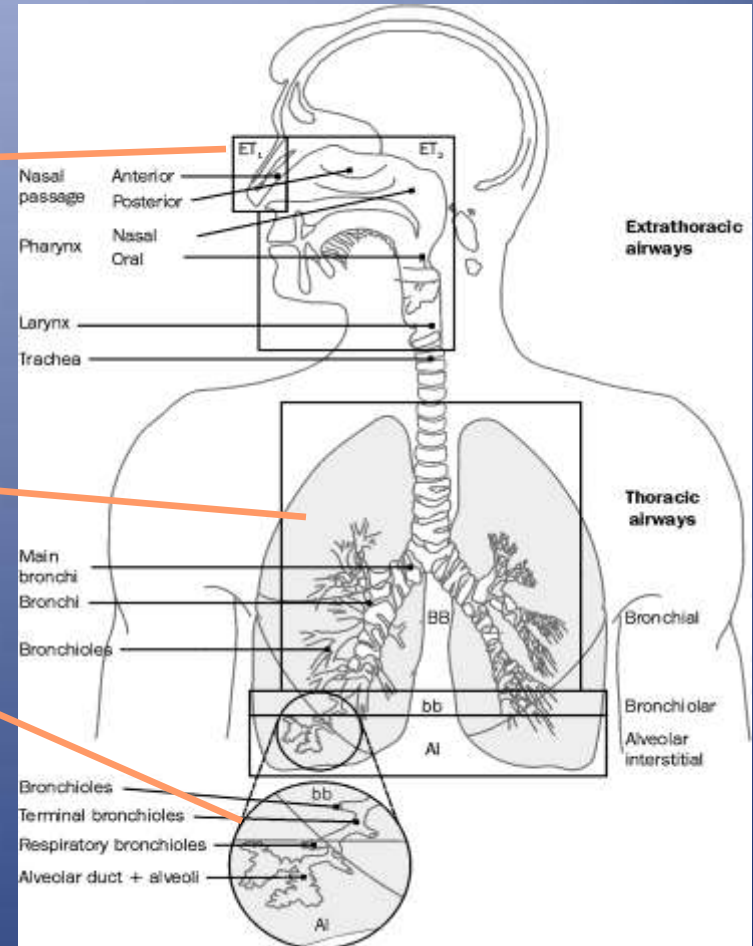
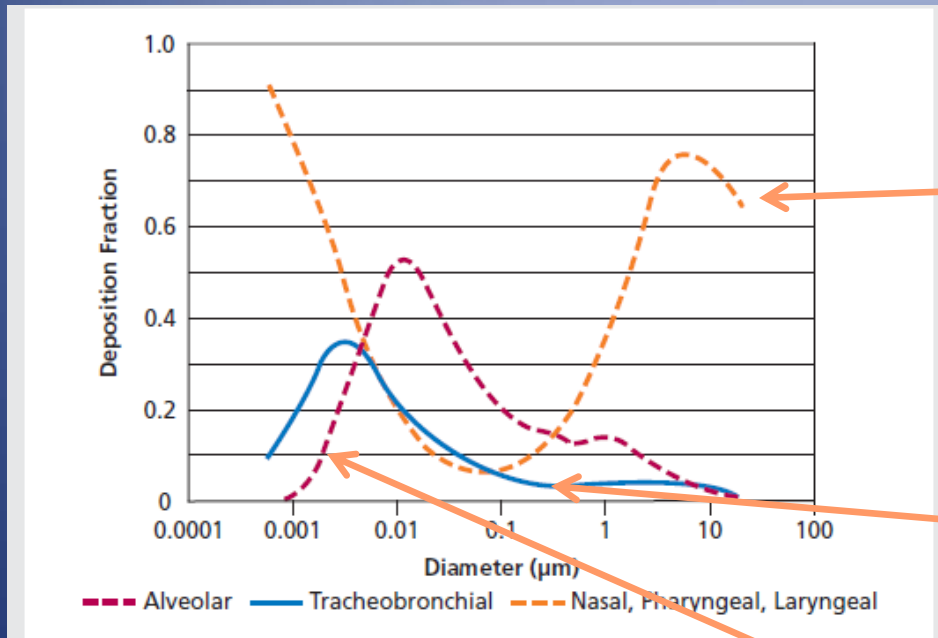




Schematics of human body with pathways of exposure to nanoparticles, affected organs, and associated diseases from epidemiological, in vivo and in vitro studies.

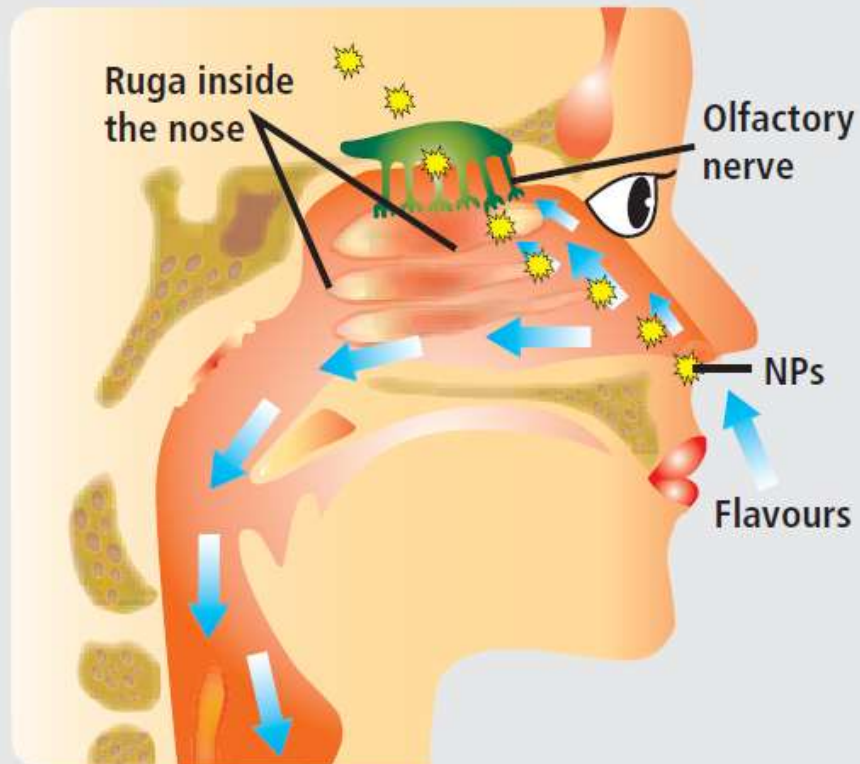


Illustration of the deposition loci (ET1, ET2, BB, bb, and alveolar) within the human respiratory tract

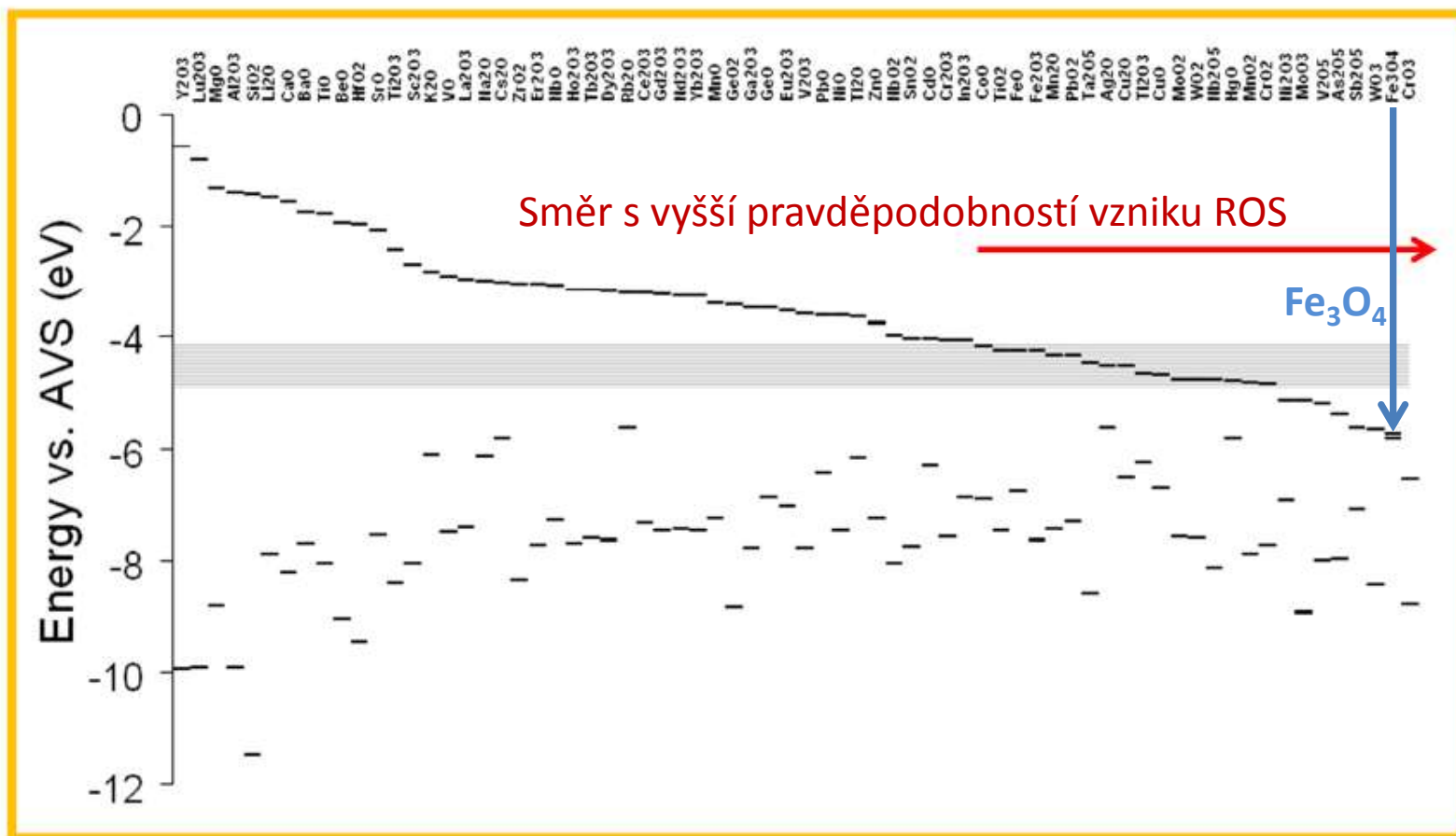


Human nasal passage system

Based on studies in rodents, passage of nanoparticles (NP^{}) from the nose into the brain via the cribriform plate that separates the nasal cavity from the brain and supports the olfactory nerves and receptors (olfactory bulb, green) responsible for sensing smell and taste.*



Redox potenciál oxidů a vyvolání ROS (oxidativního stresu)
masivní produkce ROS jako nástroj imunitní *ochrany* (superoxid $O_2 \cdot^-$;
hydroxylový radikál $OH \cdot$; peroxy $ROO \cdot$ a další)

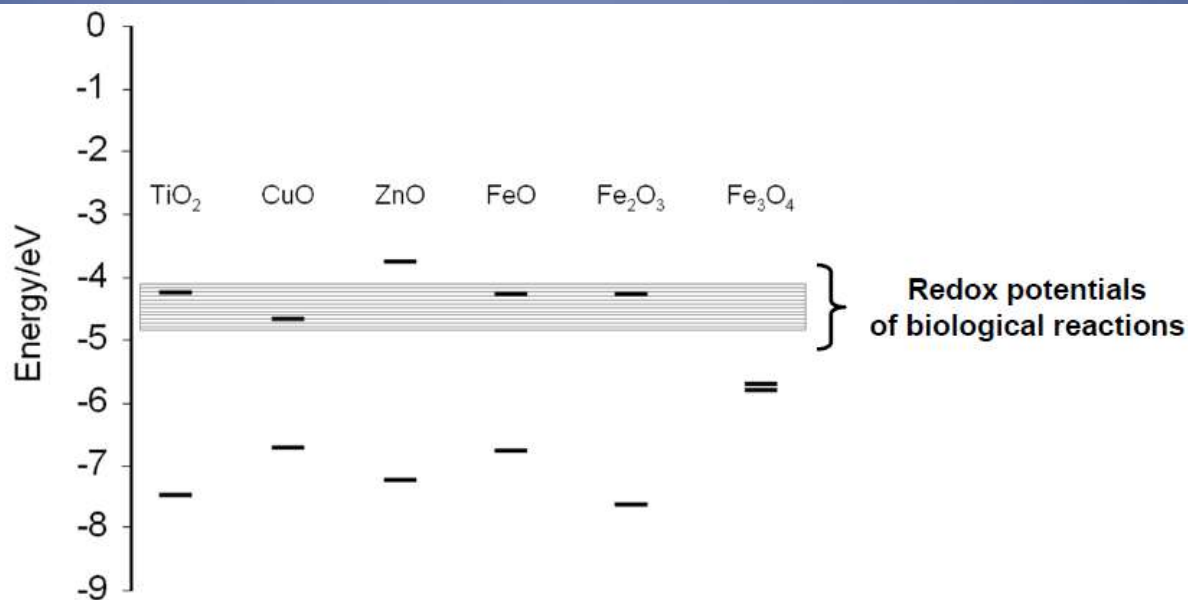




ROS (reactive oxygen species)

Nerovnováha mezi volnými radikály a antioxidanty. Volné radikály mohou být definovány jako molekuly, případně molekulové fragmenty, obsahující jeden nebo více nepárových elektronů v atomových či molekulových orbitalech.

Využití výpočetní metody „quantitative structure–activity relationship“ (QSAR) pro předpověď nanotoxicity kovových oxidů





Hypotetický příklad stanovení počtu deponovaných částic v dýchacím traktu.

Na základě zjištěných měření a s použitím experimentálně stanovených depozičních křivek můžeme odvodit následující skutečnost – počet nanočástic může dosáhnout zcela běžně hodnot $10\ 000\ \text{cm}^{-3}$. Představuje-li jeden nádech v klidovém stavu cca $1000\ \text{cm}^{-3}$, pak se do dýchacího traktu dostává 10mil. nanočástic/nádech. Pokud dojde k depozici pouhých 10% vdechnutých částic, představuje tento podíl 1 000 000 částic. Při 10 nádeších za minutu je to 10 000 000 nanočástic.

...

Jaký je jejich další osud?



Four Ostrava locations where nanoparticle concentration and distribution were measured





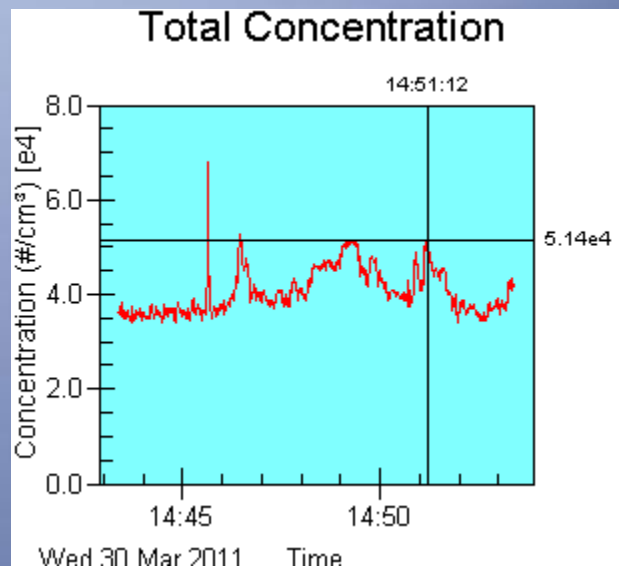
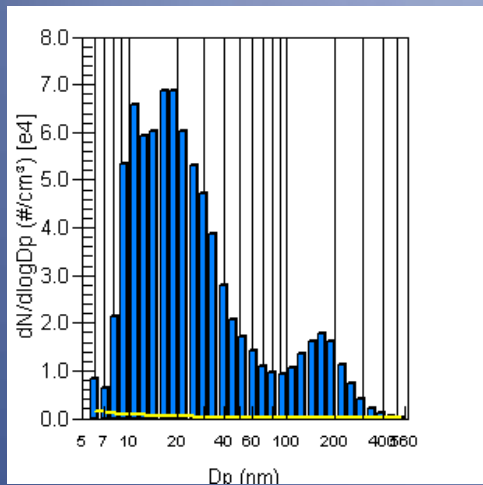
Odběrové místo – Ostrava Mariánské Hory, 7.9.2011



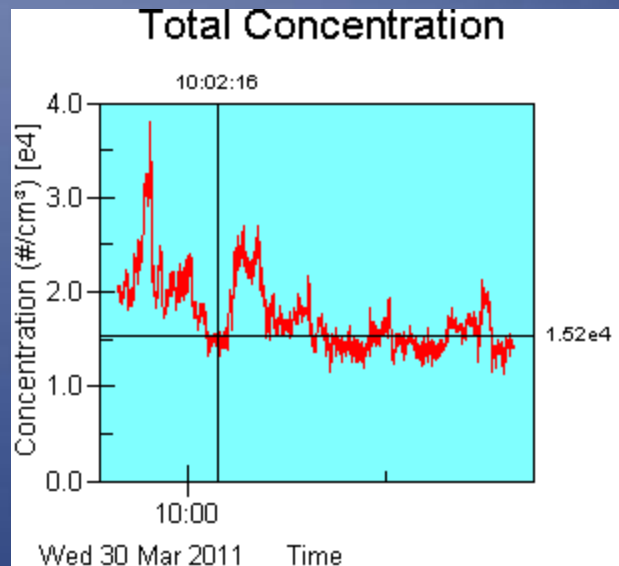
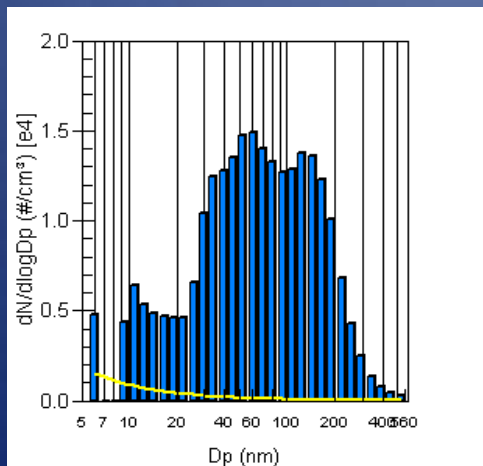
Odběrové místo – Ostrava Bartovice, 7.9.2011



Ostrava – Bartovice

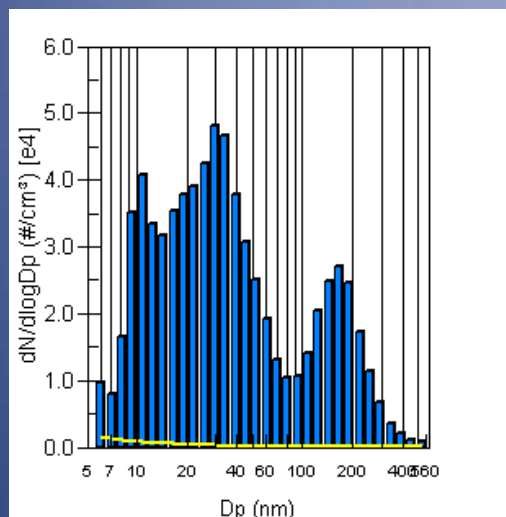


Ostrava – Mariánské Hory

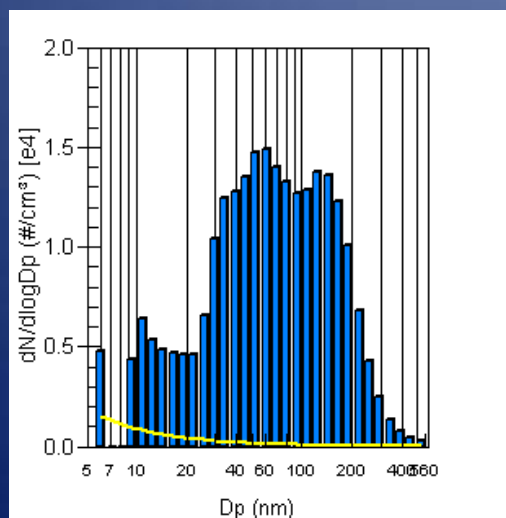
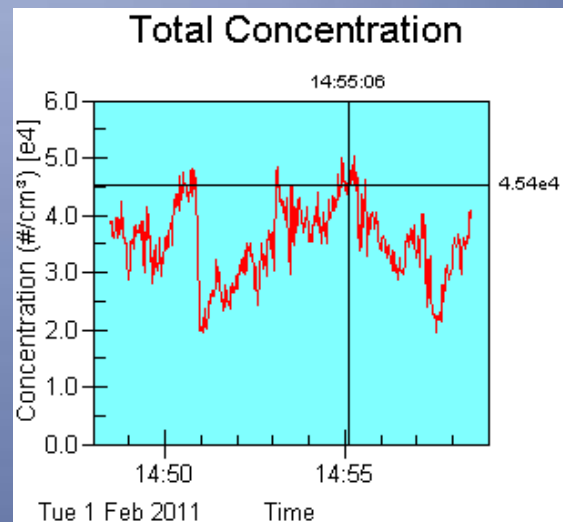




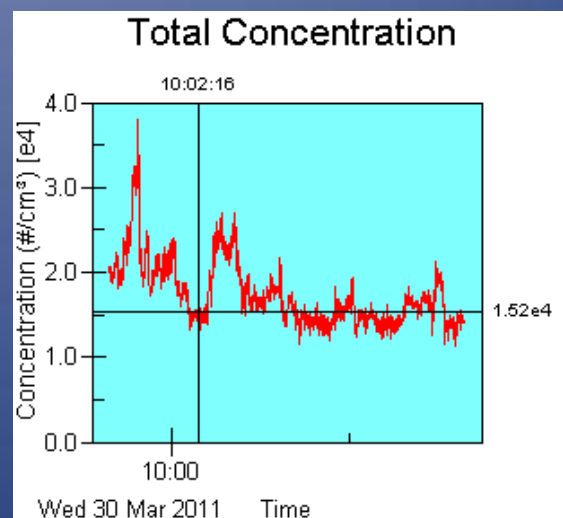
Srovnání 2 měření 1.2.2011 a 30.3.2011 – lokalita Mariánské Hory



1.2.2011 14,55 hod

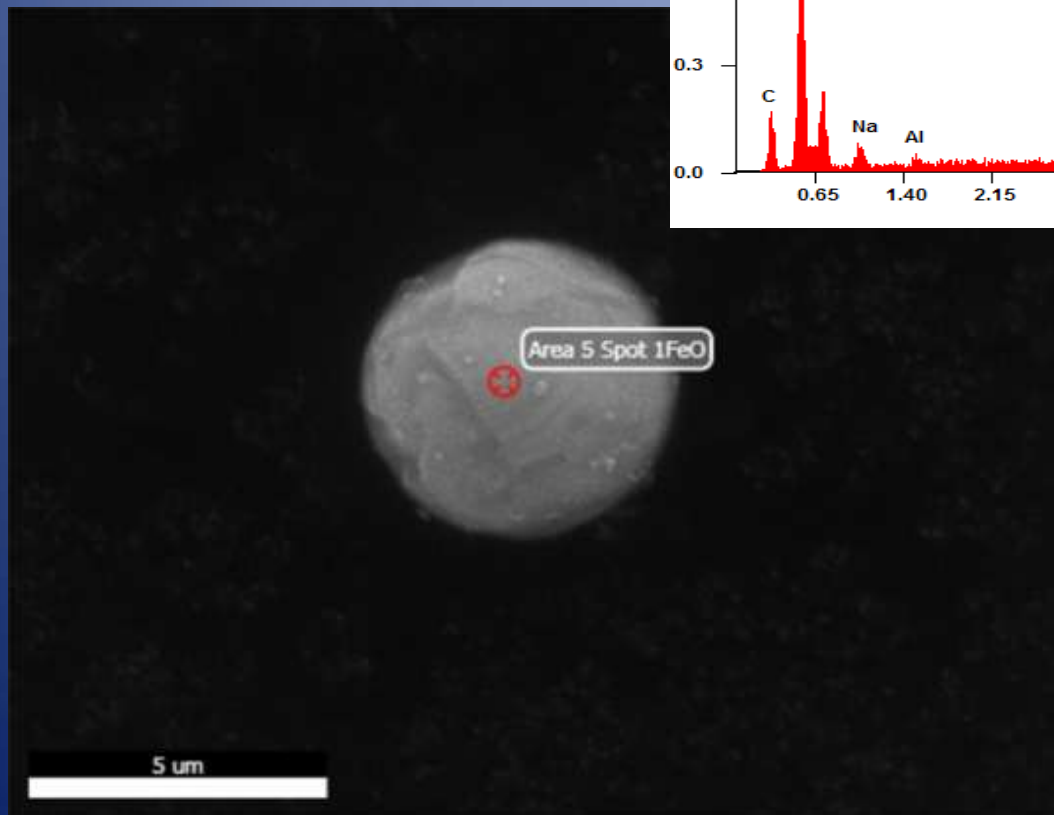
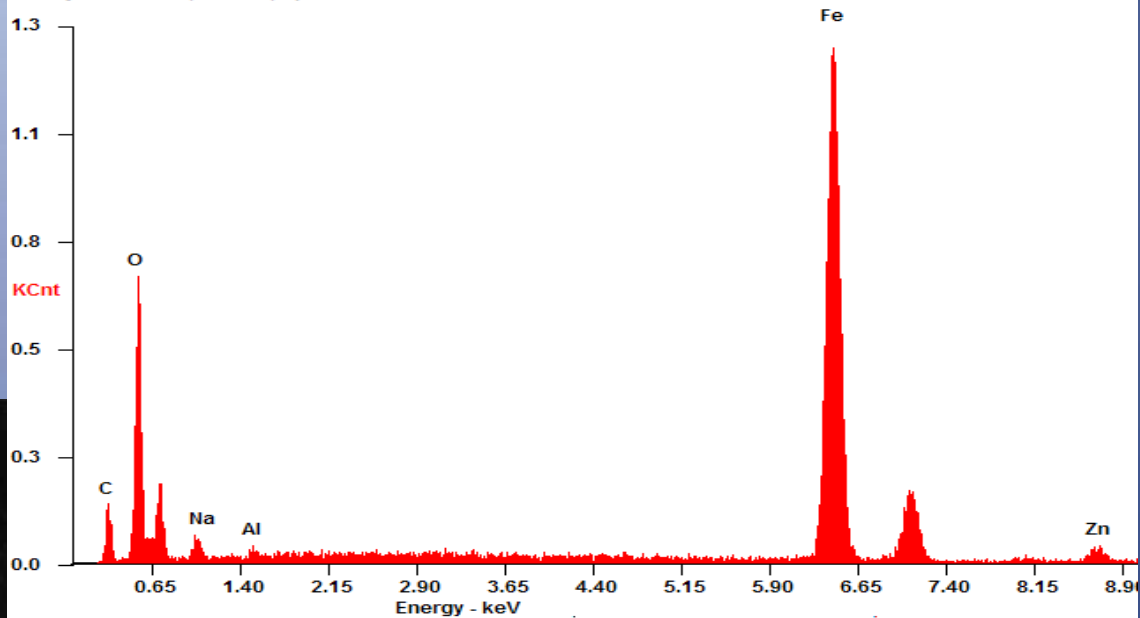


30.3.2011 10,02 hod





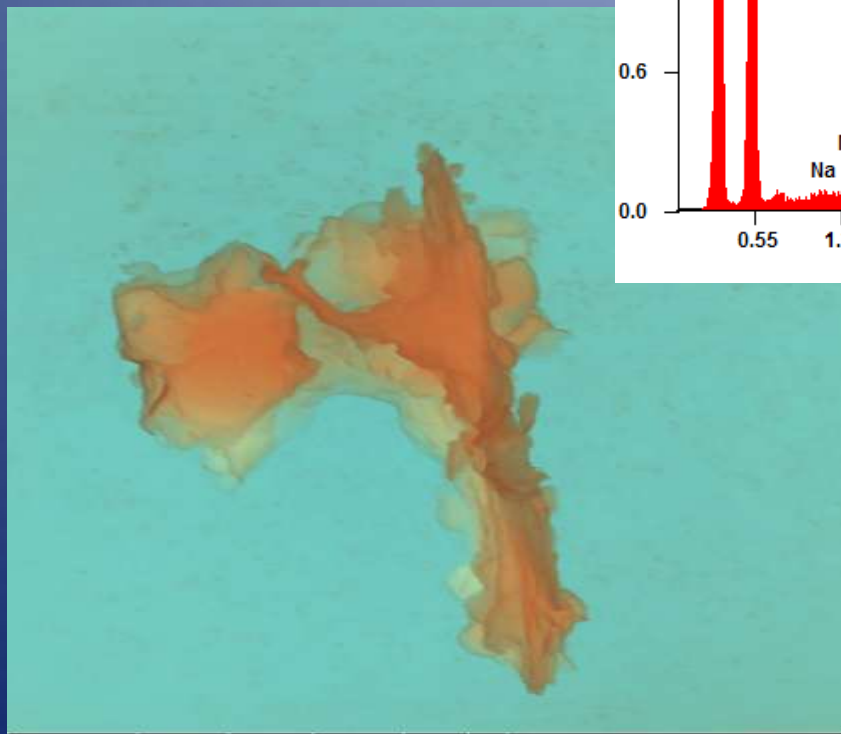
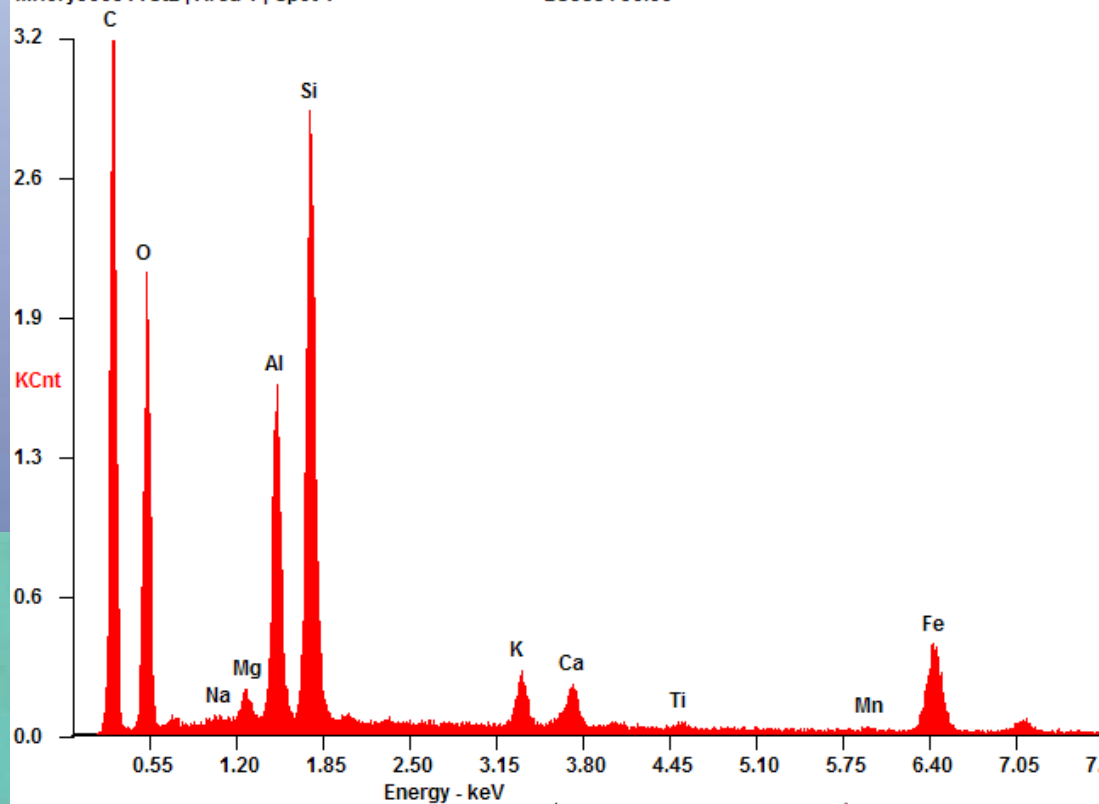
D:\SharedData2\MHory300311 St2_Ar5Sp1_FeO.spc 19-Aug-2011 07:35:49
MHory300311 St2 | Area 5 | Spot 1FeO LSecs : 30.00



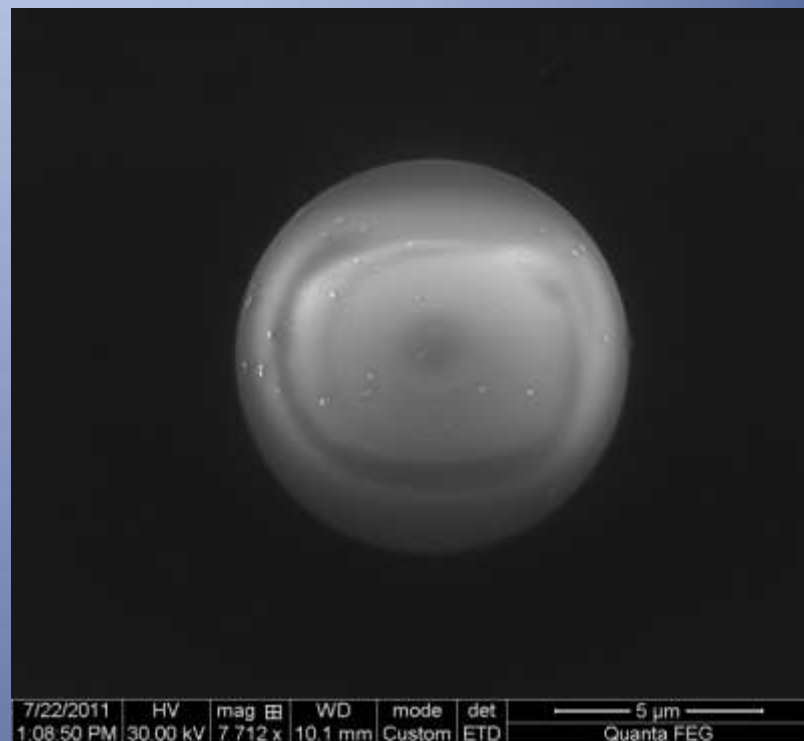
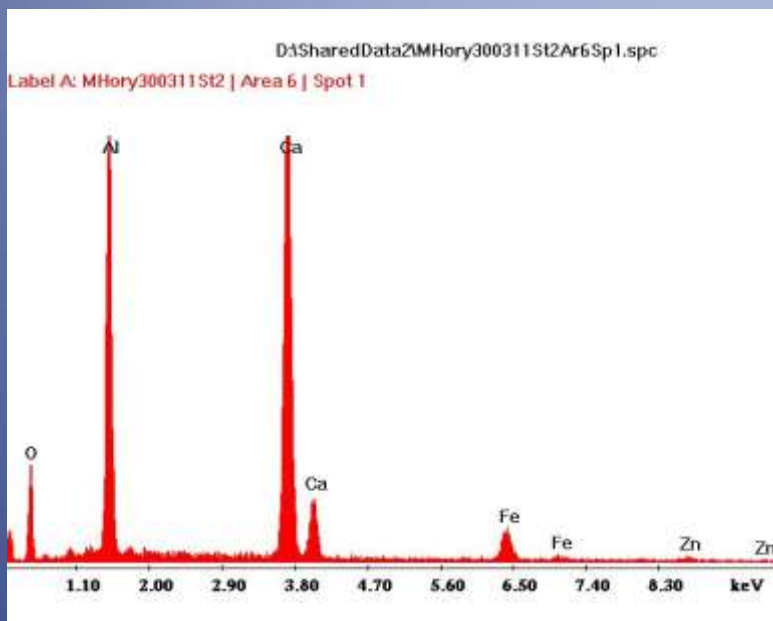
Element	Weight %	Atomic %
C K	21.67	34.73
O K	44.57	53.62
NaK	0.01	0
AlK	0.31	0.22
FeK	31.53	10.87
ZnK	1.9	0.56

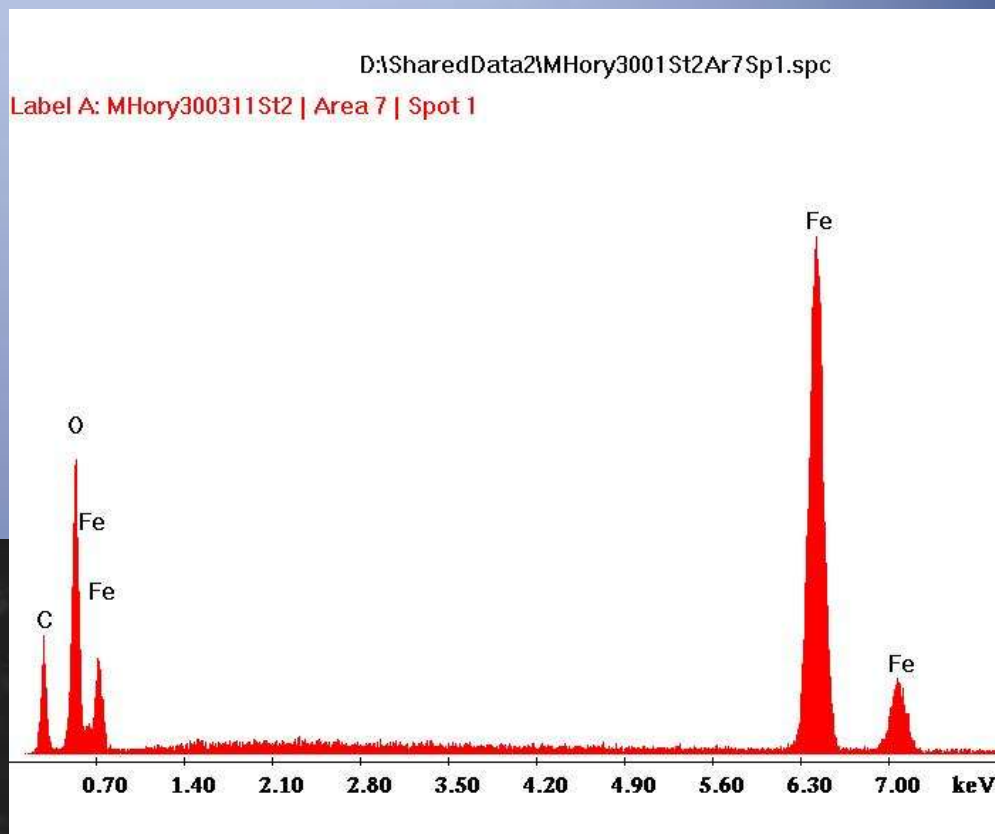
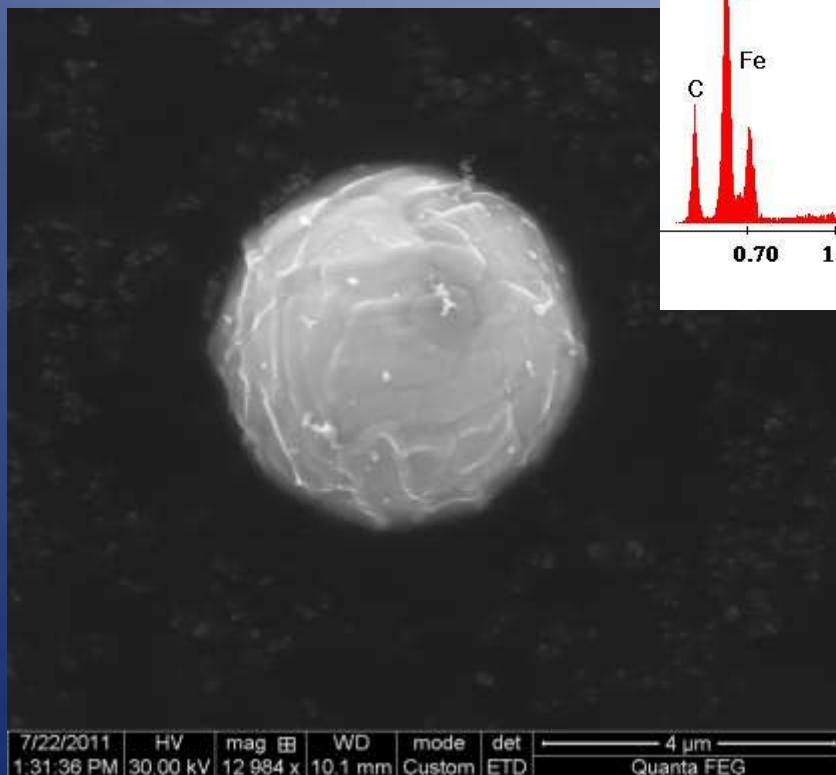


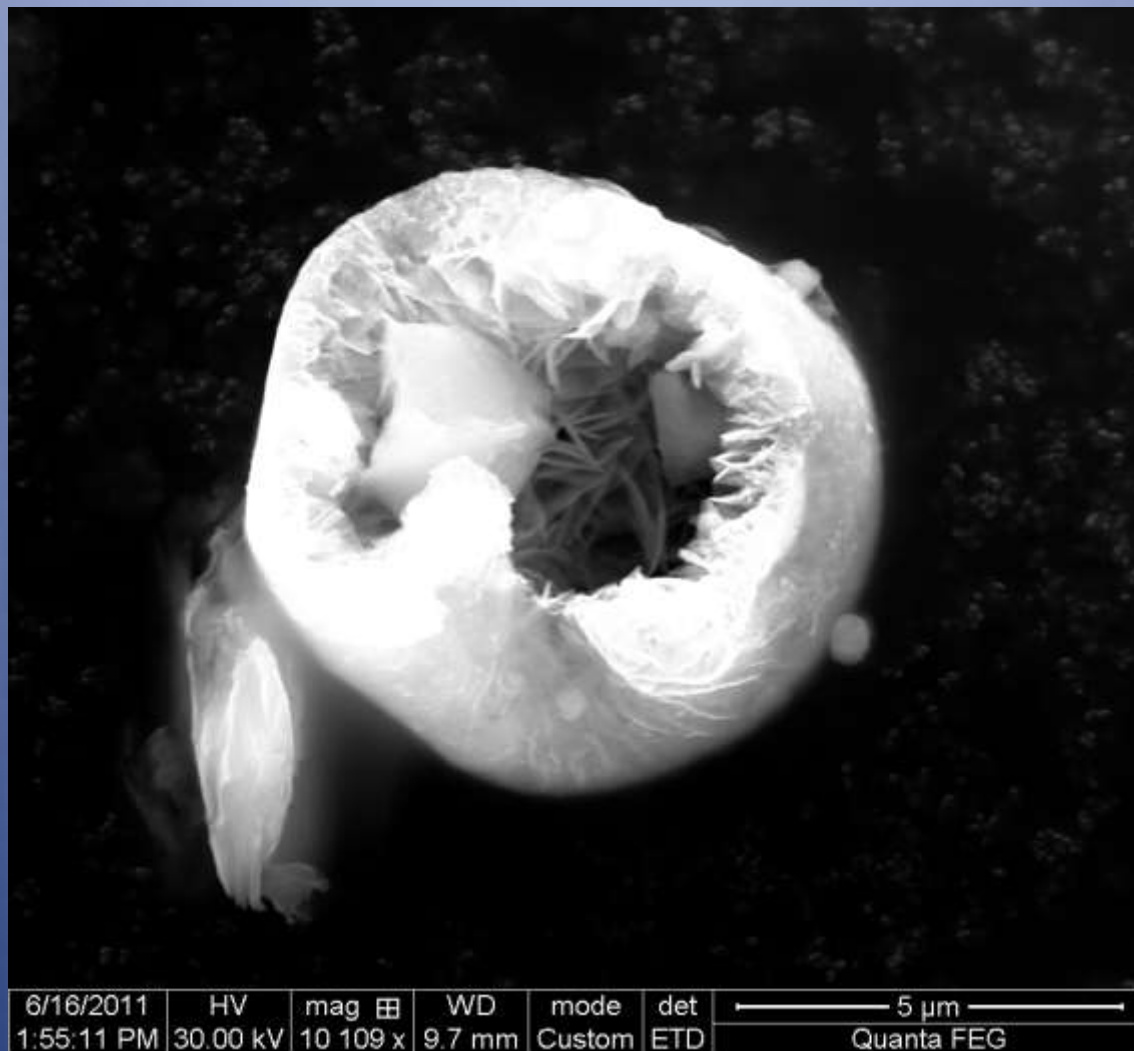
D:\SharedData2\MHory300311St2Ar1Sp1.spc 19-Aug-2011 10:23:54
MHory300311St2 | Area 1 | Spot 1 LSecs : 30.00

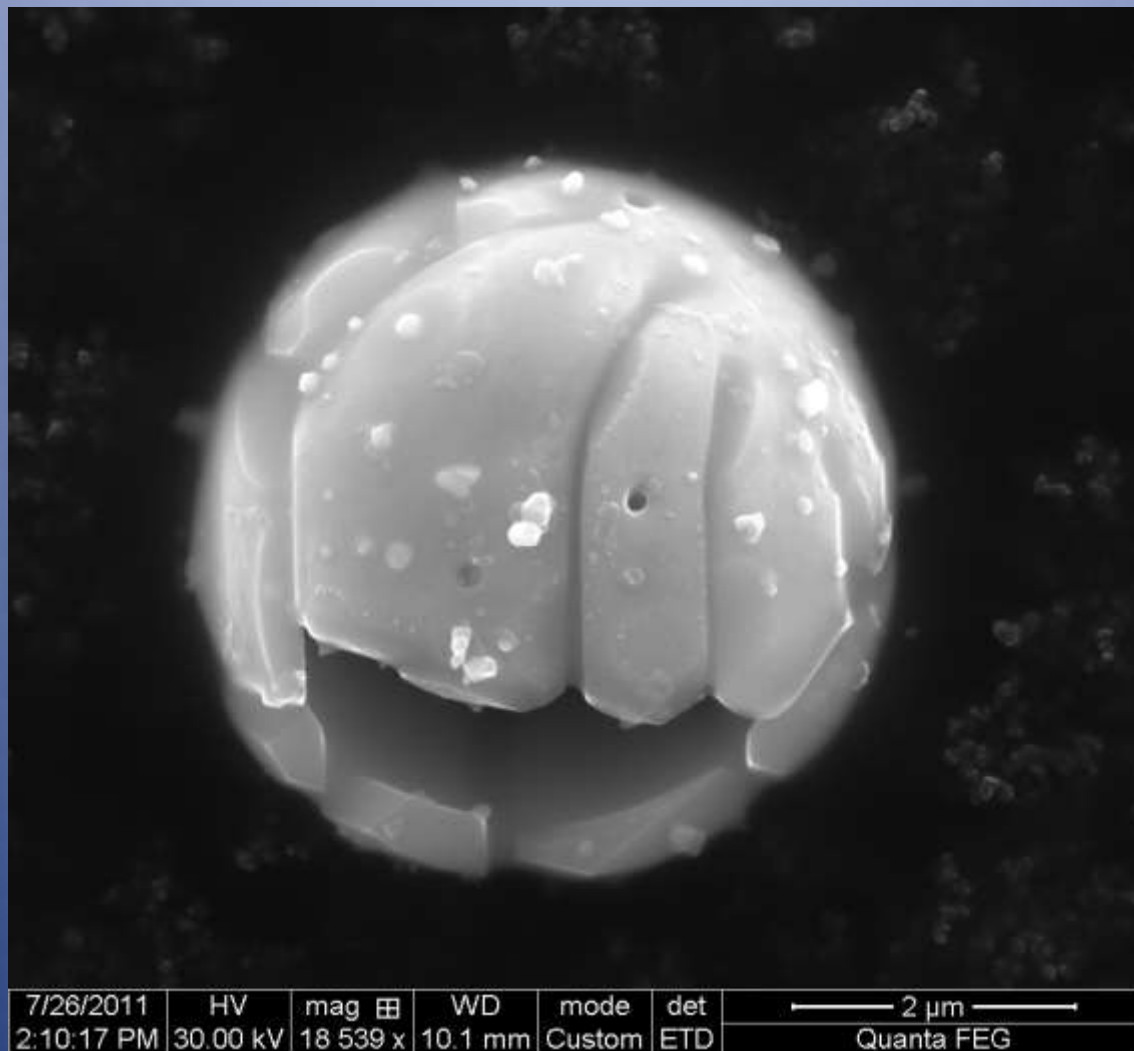


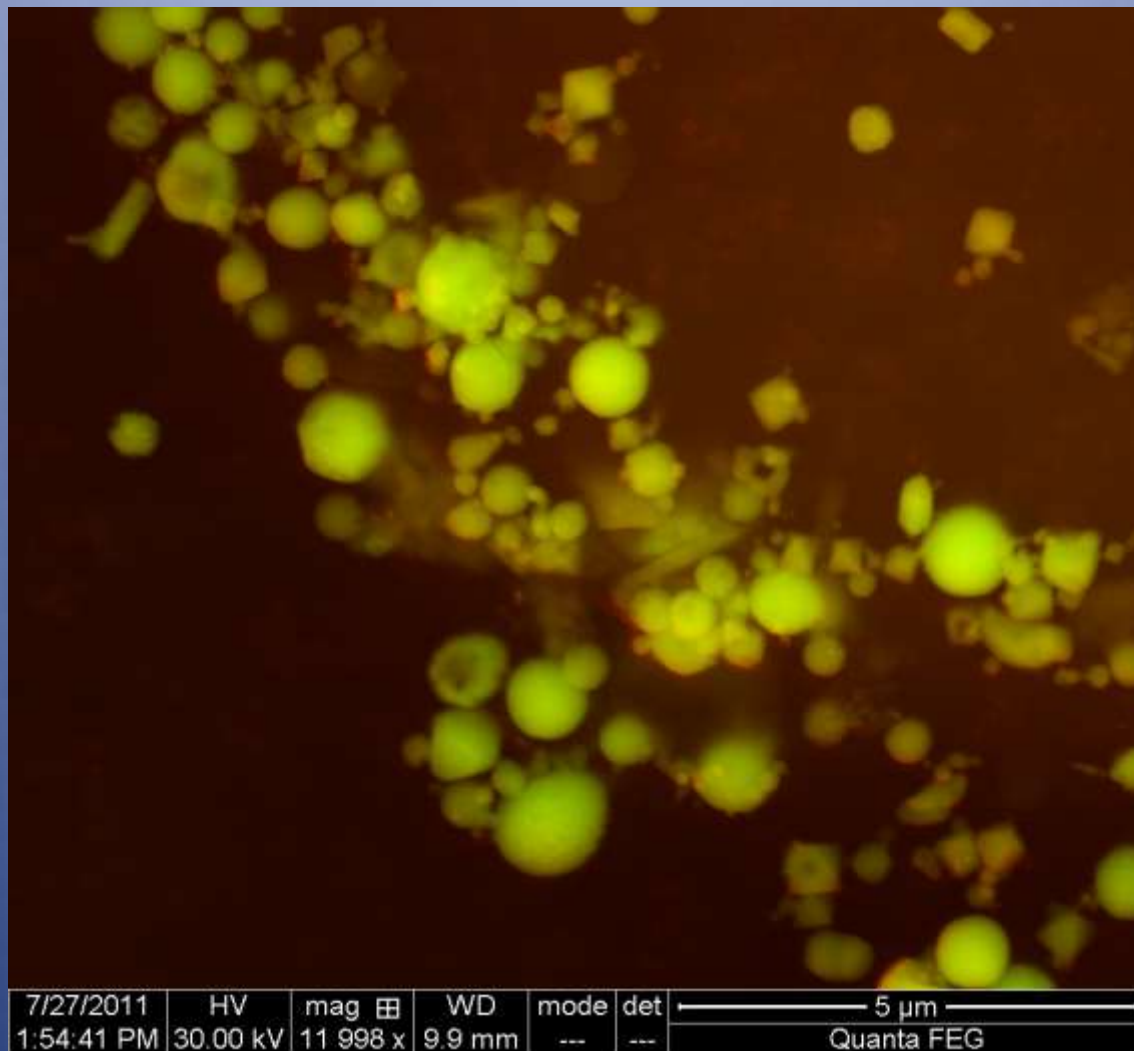
7/22/2011 HV mag 田 WD mode det
10:44:20 AM 30.00 kV 3 536 x 10.1 mm --- ---
10 μm
Quanta FEG





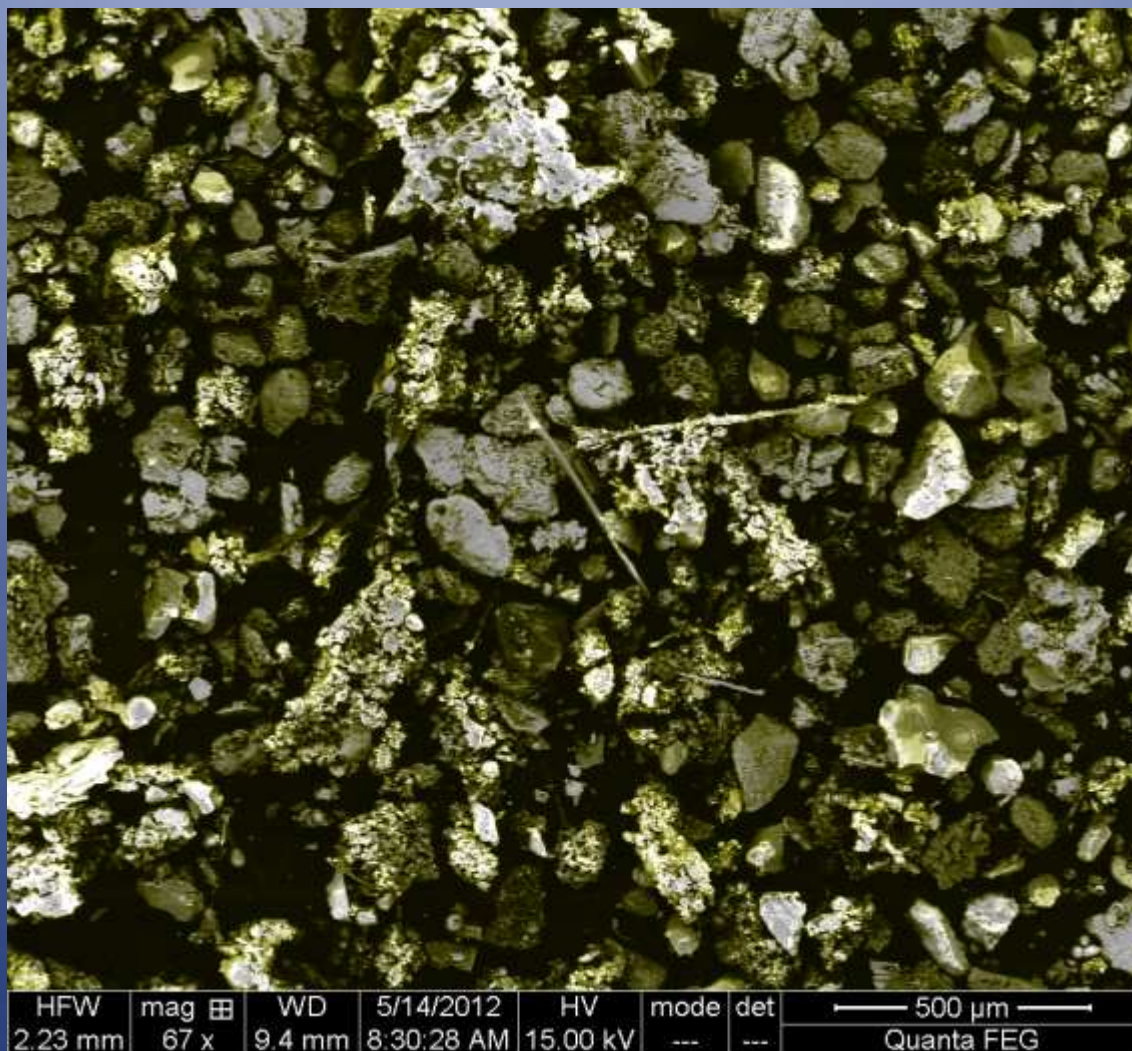






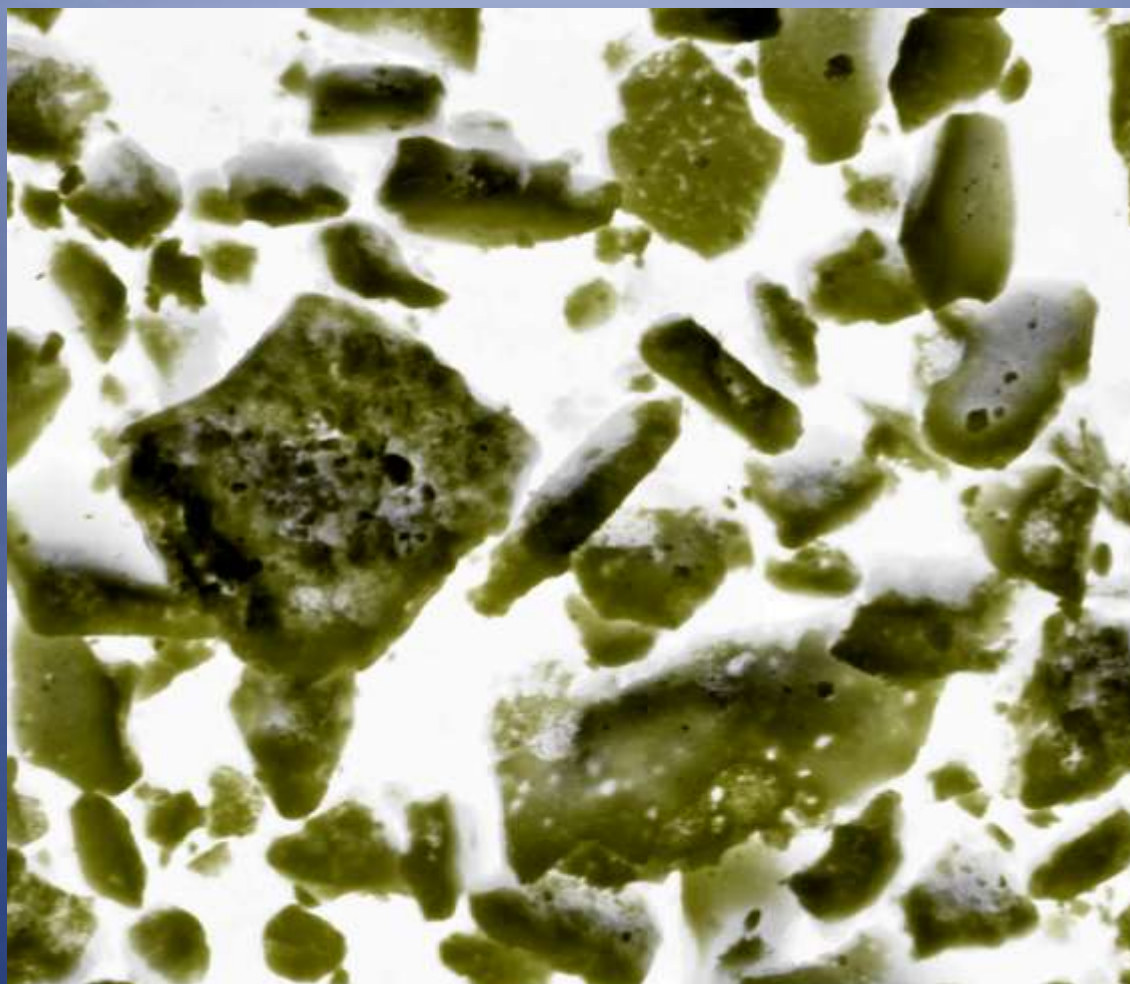


Vzhled jemných částic suspendovaného prachu odebraného v Kopřivnici





Vzhled jemných částic suspendovaného prachu odebraného v Kopřivnici

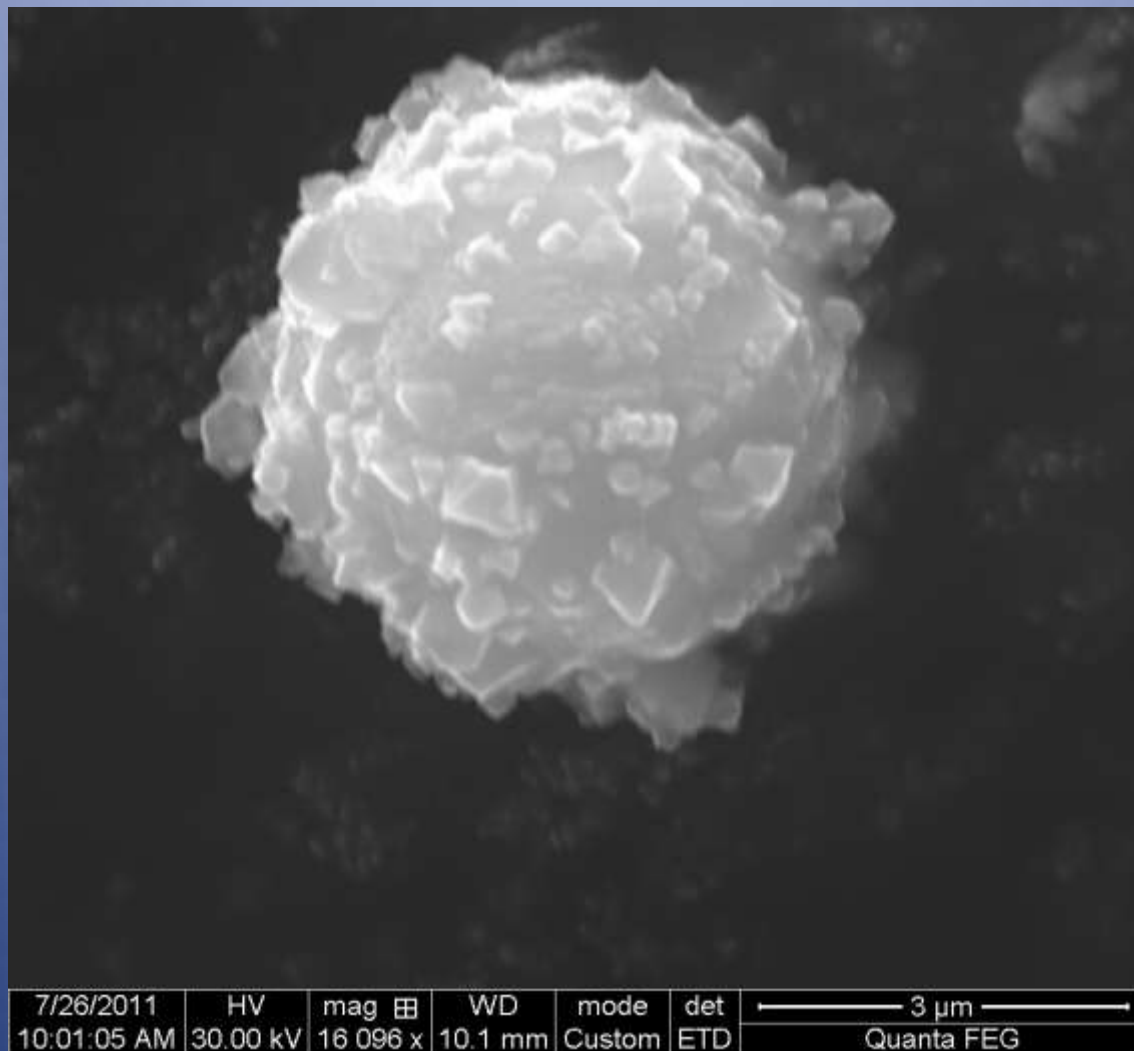


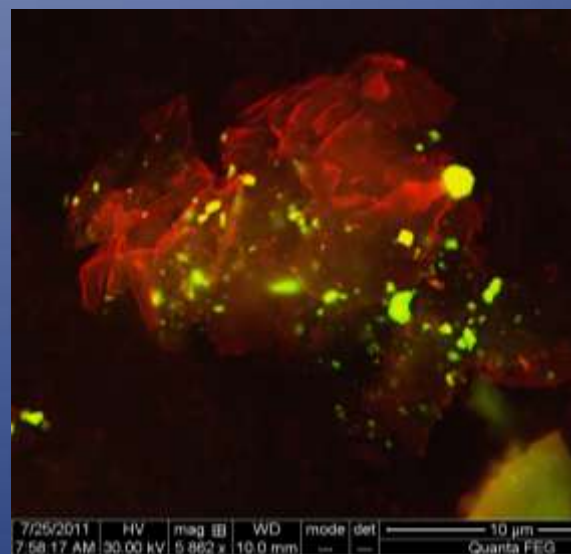
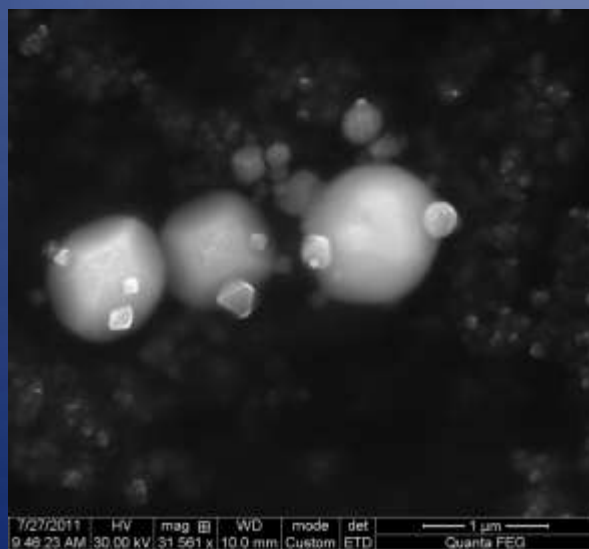
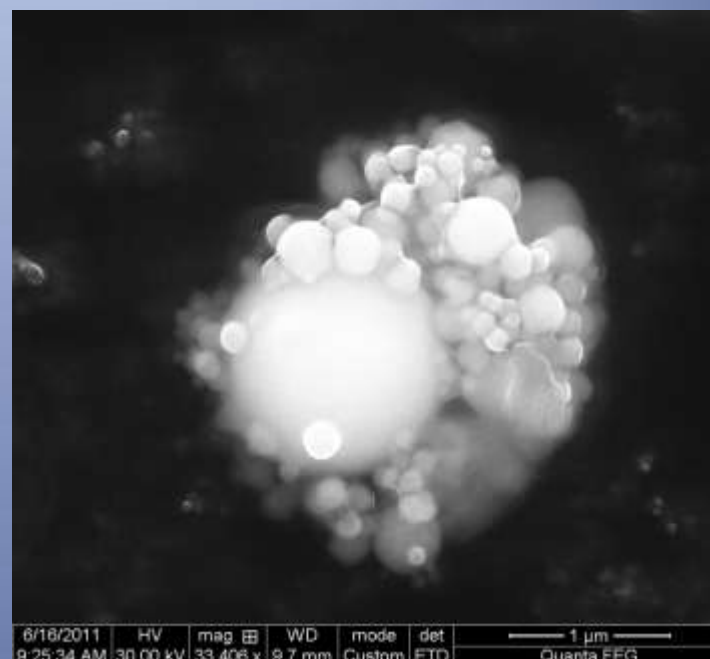
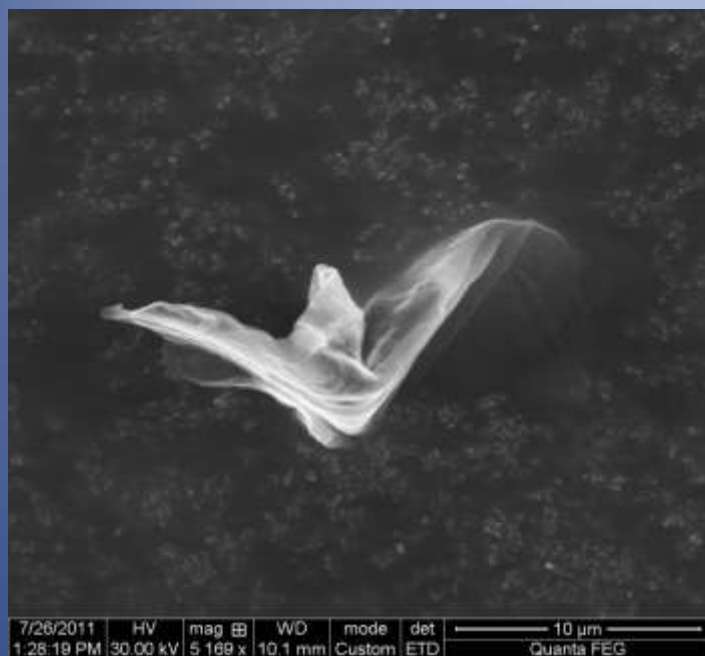
HFW	4/11/2012	HV	mag	WD	mode	det	10 µm
44.9 µm	11:13:26 AM	15.00 kV	3 322 x	10.0 mm	---	---	Quanta FEG

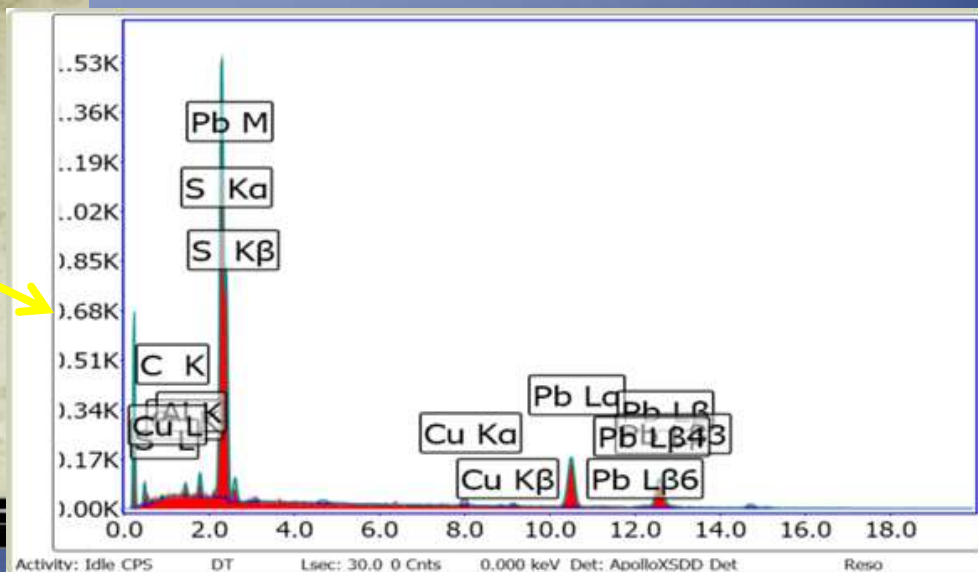
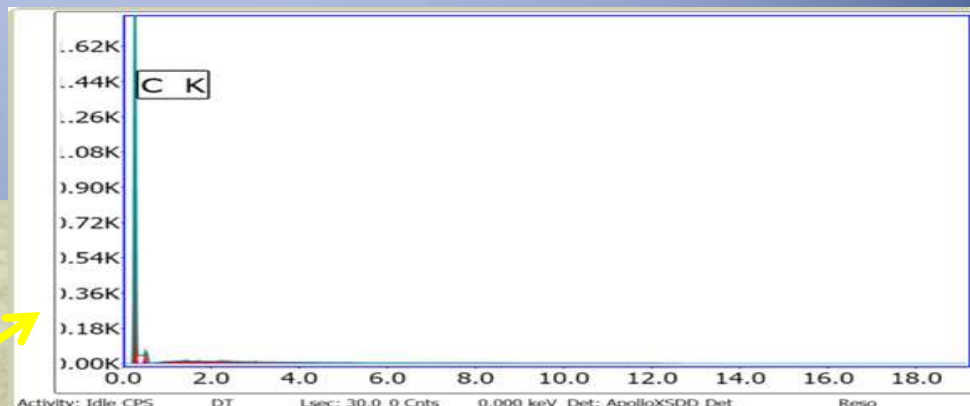


Částice odebrané na provozu ocelárny



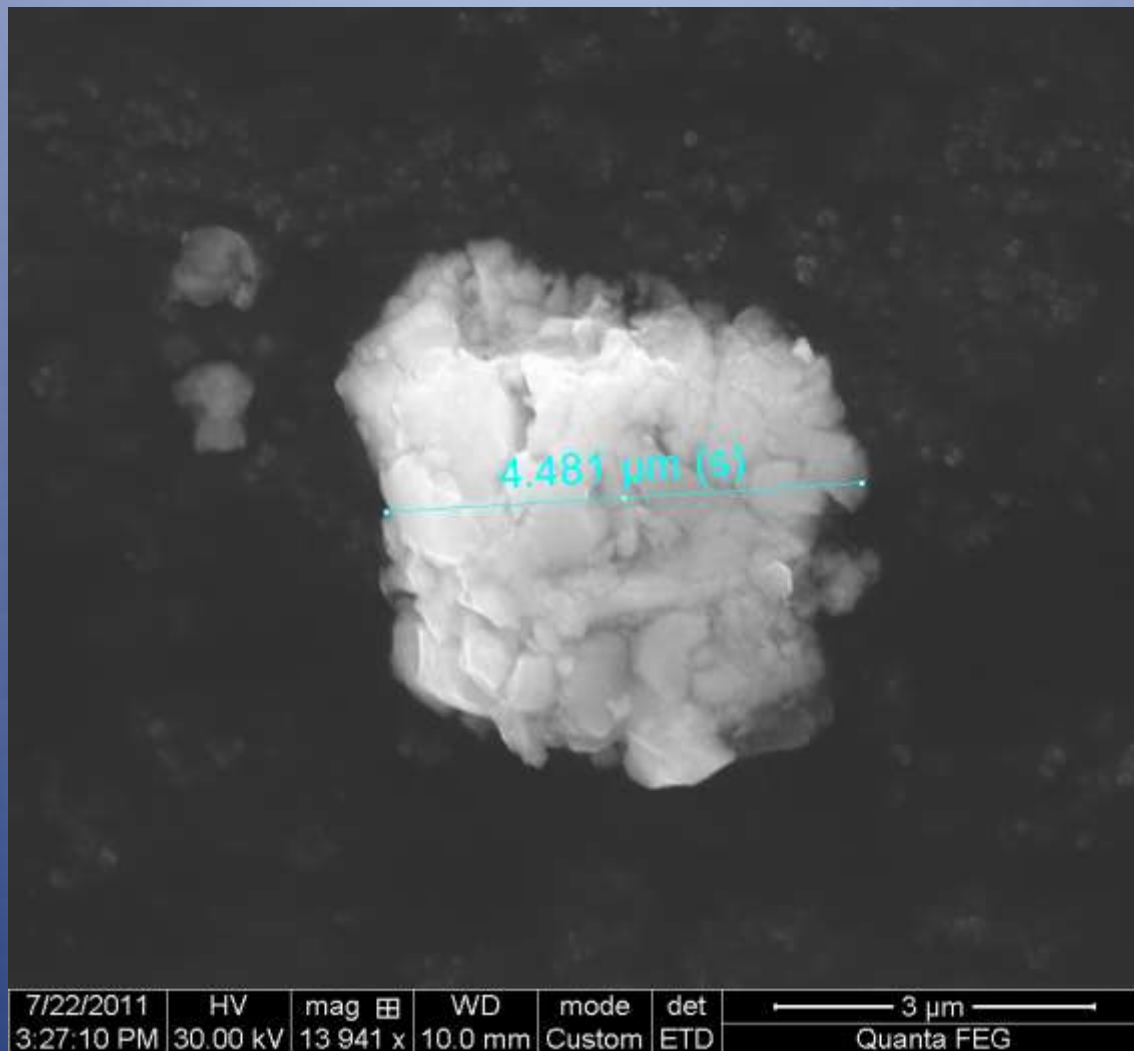






7/22/2011 HV mag B WD mode det
1:43:23 PM 30.00 kV 3 568 x 10.0 mm --- ---
10 µm
Quanta FEG

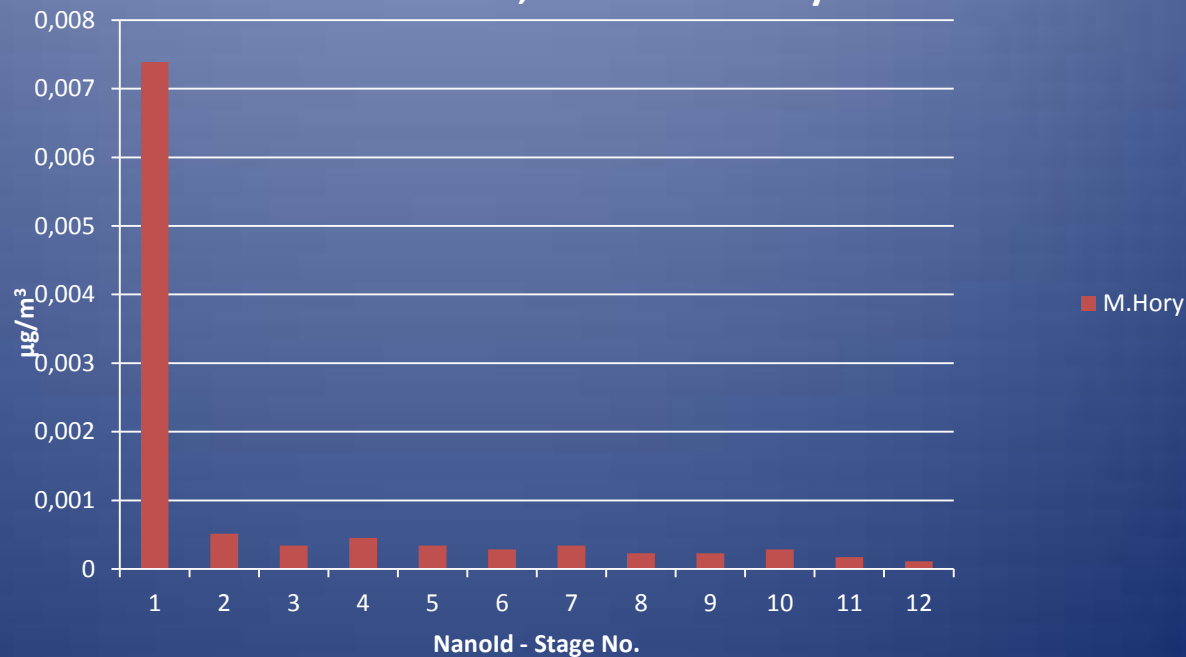
Matrice – uhlík, v základní uhlíkové matrici jsou fixovány částice olova.





Stage	Minimal diameter	Maximal diameter	Substrate
	D_{\min} (μm)	D_{\max} (μm)	
1	20	35	glass slide
2	8,1	20	glass slide
3	4	8,1	glass slide
4	2	4	glass slide
5	1	2	glass slide
6	0,5	1	glass slide
7	0,25	0,5	glass slide
8	0,06	0,25	FF filter
9	0,015	0,06	nylon net
10	0,005	0,015	nylon net
11	0,0015	0,005	nylon net
12	0,001	0,0015	nylon net

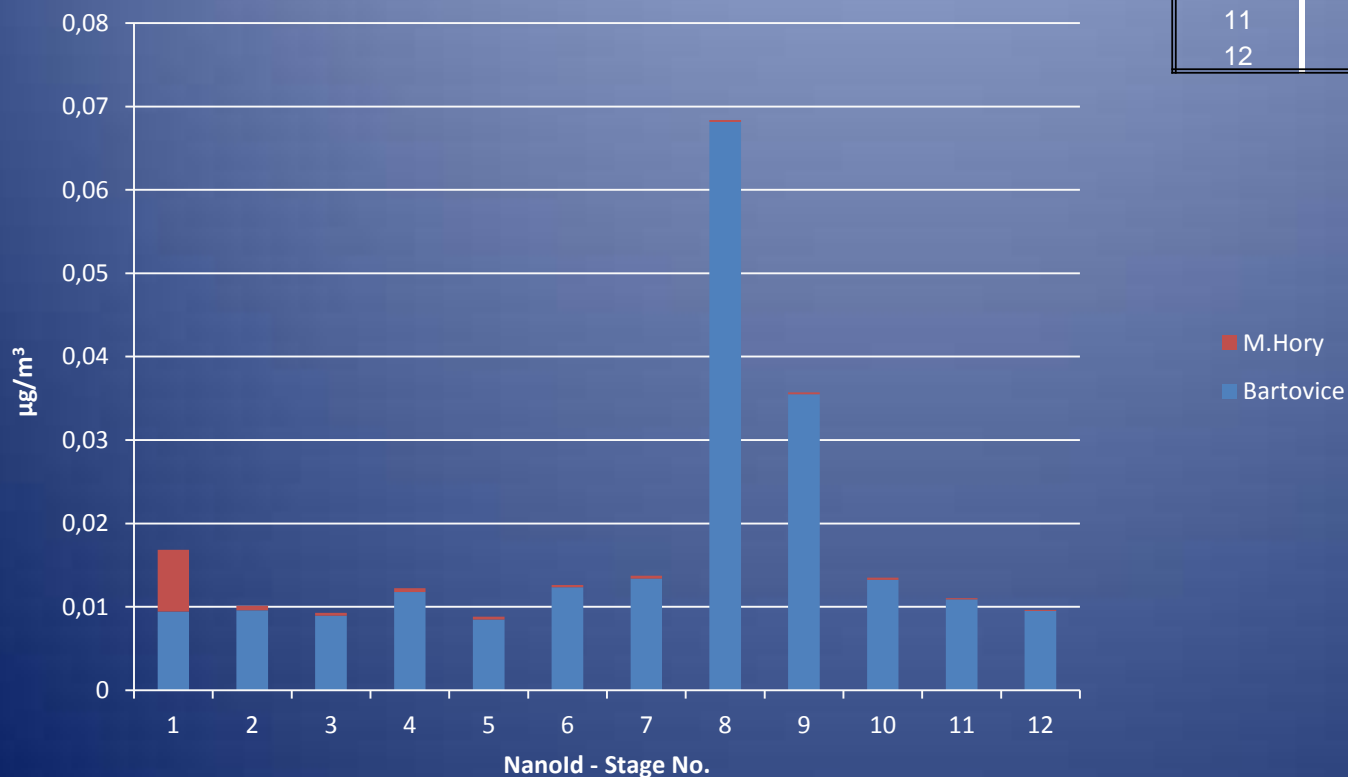
Olovo, Ostrava M. Hory





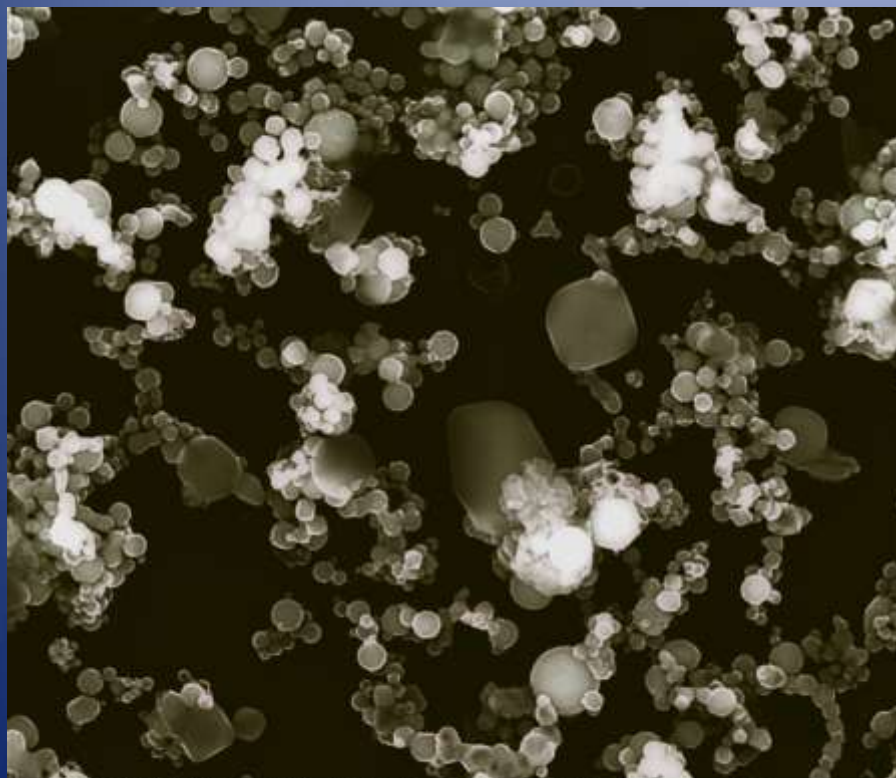
Stage	Minimal diameter	Maximal diameter	Substrate
	D _{min} (µm)	D _{max} (µm)	
1	20	35	glass slide
2	8,1	20	glass slide
3	4	8,1	glass slide
4	2	4	glass slide
5	1	2	glass slide
6	0,5	1	glass slide
7	0,25	0,5	glass slide
8	0,06	0,25	FF filter
9	0,015	0,06	nylon net
10	0,005	0,015	nylon net
11	0,0015	0,005	nylon net
12	0,001	0,0015	nylon net

Olovo - srovnání Ostr. Bartovice v. Ostrava M. Hory, 30.3.2011





Bartovice, 7.9.2011, Nanold Stage 6 (0,5-1 μ m)



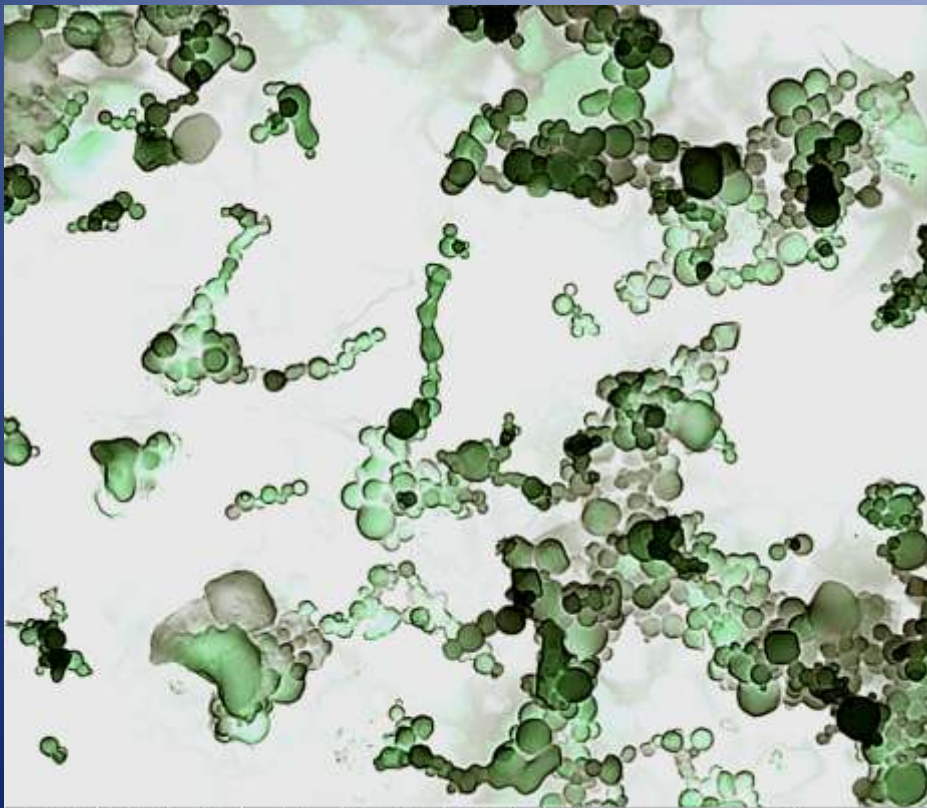
HFW	12/19/2011	HV	mag	WD	mode	3 μ m
9.59 μ m	12:29:38 PM	30.00 kV	15 563 x	11.5 mm	---	Quanta FEG



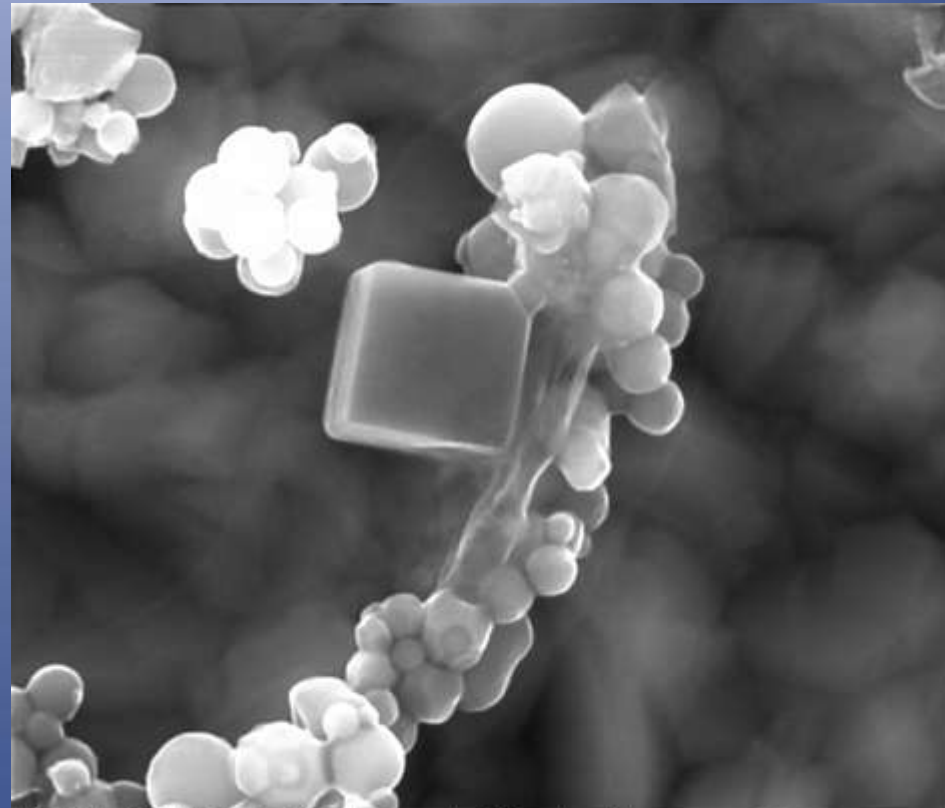
HFW	12/19/2011	HV	mag	WD	mode	500 nm
2.98 μ m	12:23:54 PM	30.00 kV	50 110 x	11.5 mm	---	Quanta FEG



Bartovice, 7.9.2011, Nanold Stage 6 (0,5-1 μ m)



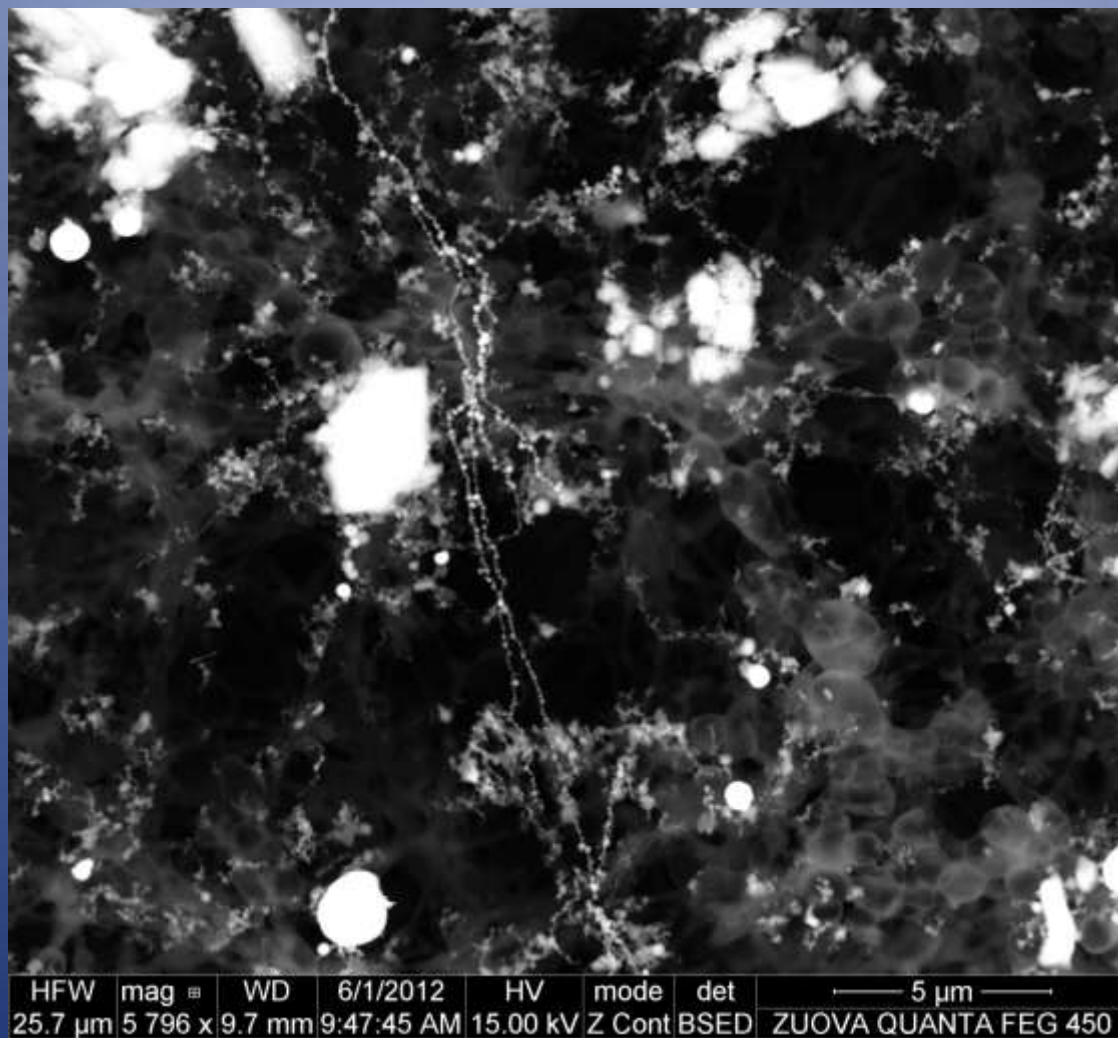
HFW	12/19/2011	HV	mag	WD	mode	3 μ m
8.99 μ m	12:18:41 PM	30.00 kV	16 601 x	11.5 mm	---	Quanta FEG



HFW	12/19/2011	HV	mag	WD	mode	500 nm
2.91 μ m	12:06:38 PM	30.00 kV	51 212 x	11.5 mm	SE	Quanta FEG



Vznik dlouhých řetězovitých útvarů z nanočástic

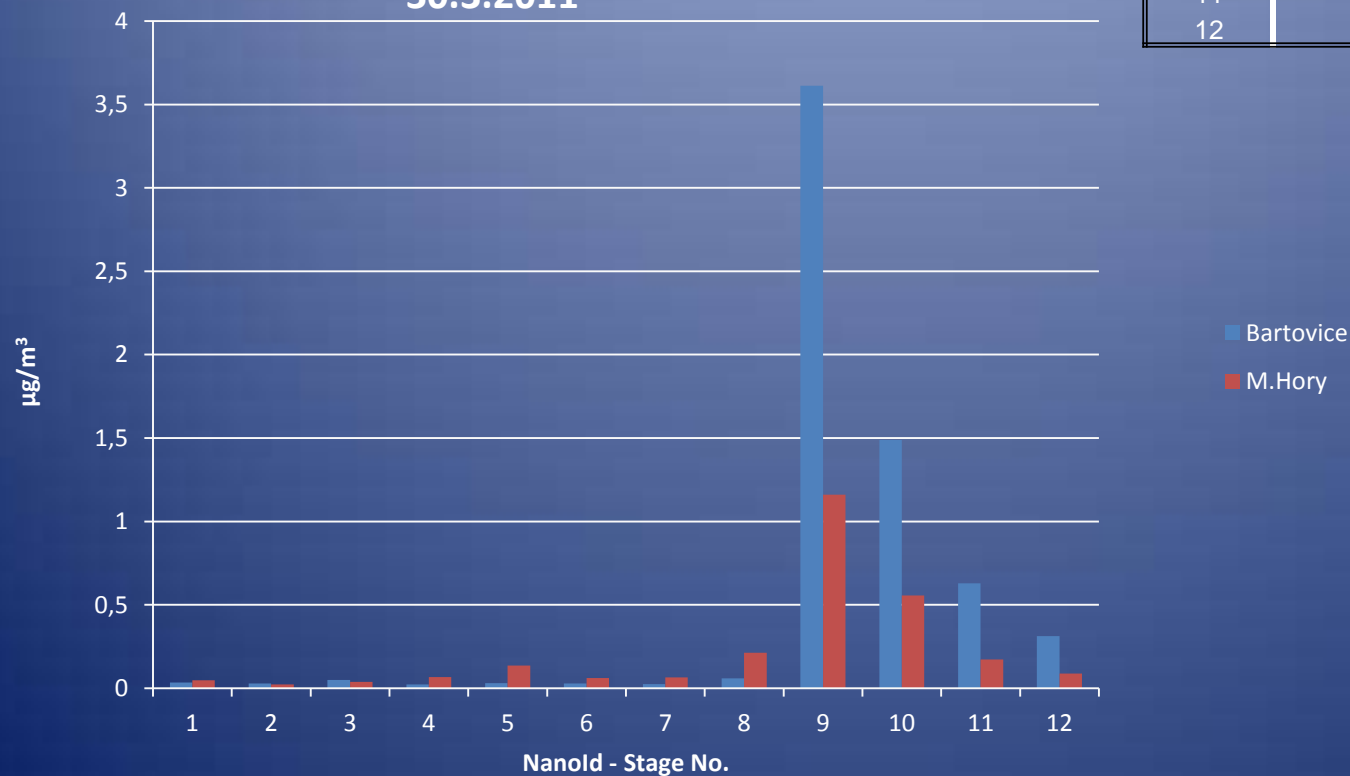


HFW	mag	WD	6/1/2012	HV	mode	det	5 μm
25.7 μm	5 796 x	9.7 mm	9:47:45 AM	15.00 kV	Z Cont	BSED	ZUOVA QUANTA FEG 450



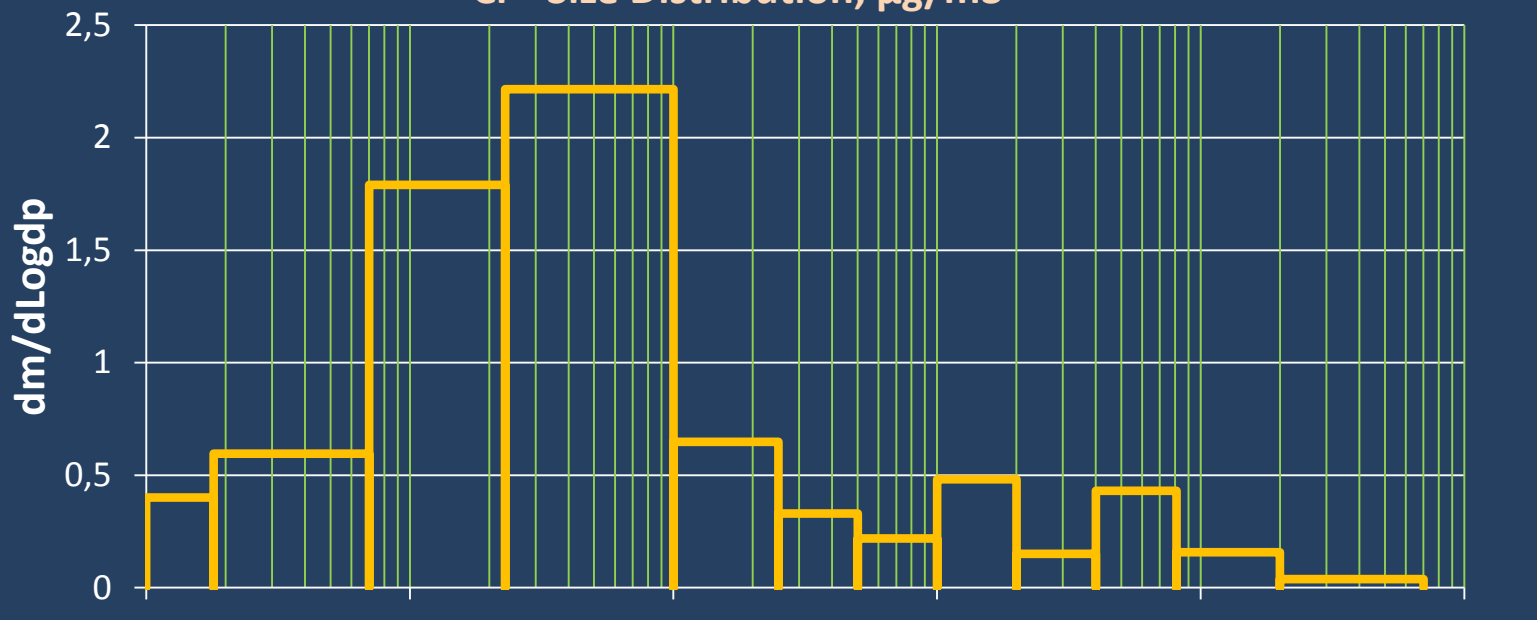
Stage	Minimal diameter	Maximal diameter	Substrate
	D _{min} (µm)	D _{max} (µm)	
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4	2	4	glass slide
5	1	2	glass slide
6	0,5	1	glass slide
7	0,25	0,5	glass slide
8	0,06	0,25	FF filter
9	0,015	0,06	nylon net
10	0,005	0,015	nylon net
11	0,0015	0,005	nylon net
12	0,001	0,0015	nylon net

**Mangan – srovnání Ostr. Bartovice v. Ostrava M. Hory,
30.3.2011**

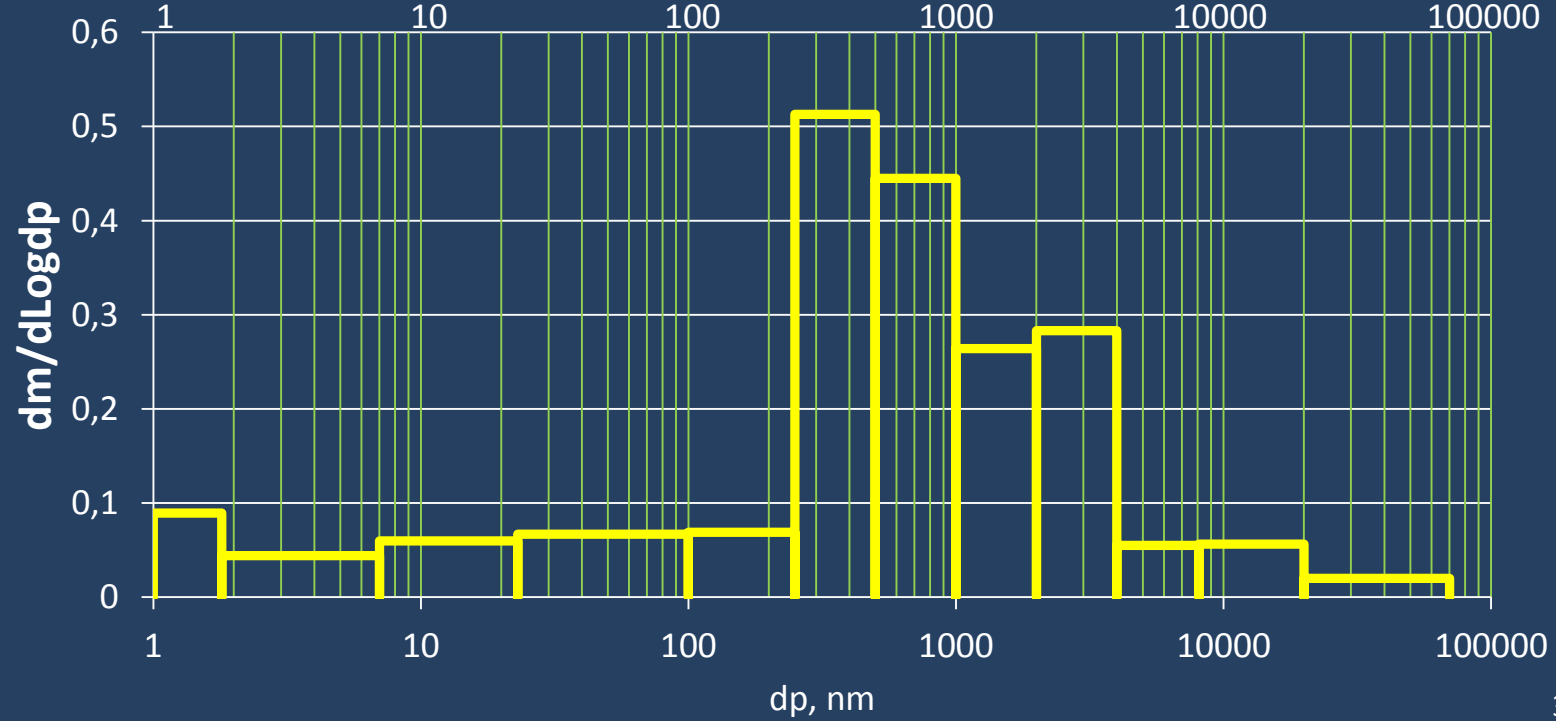


Cr - Size Distribution, $\mu\text{g}/\text{m}^3$

Bartovice, 30.3.2011



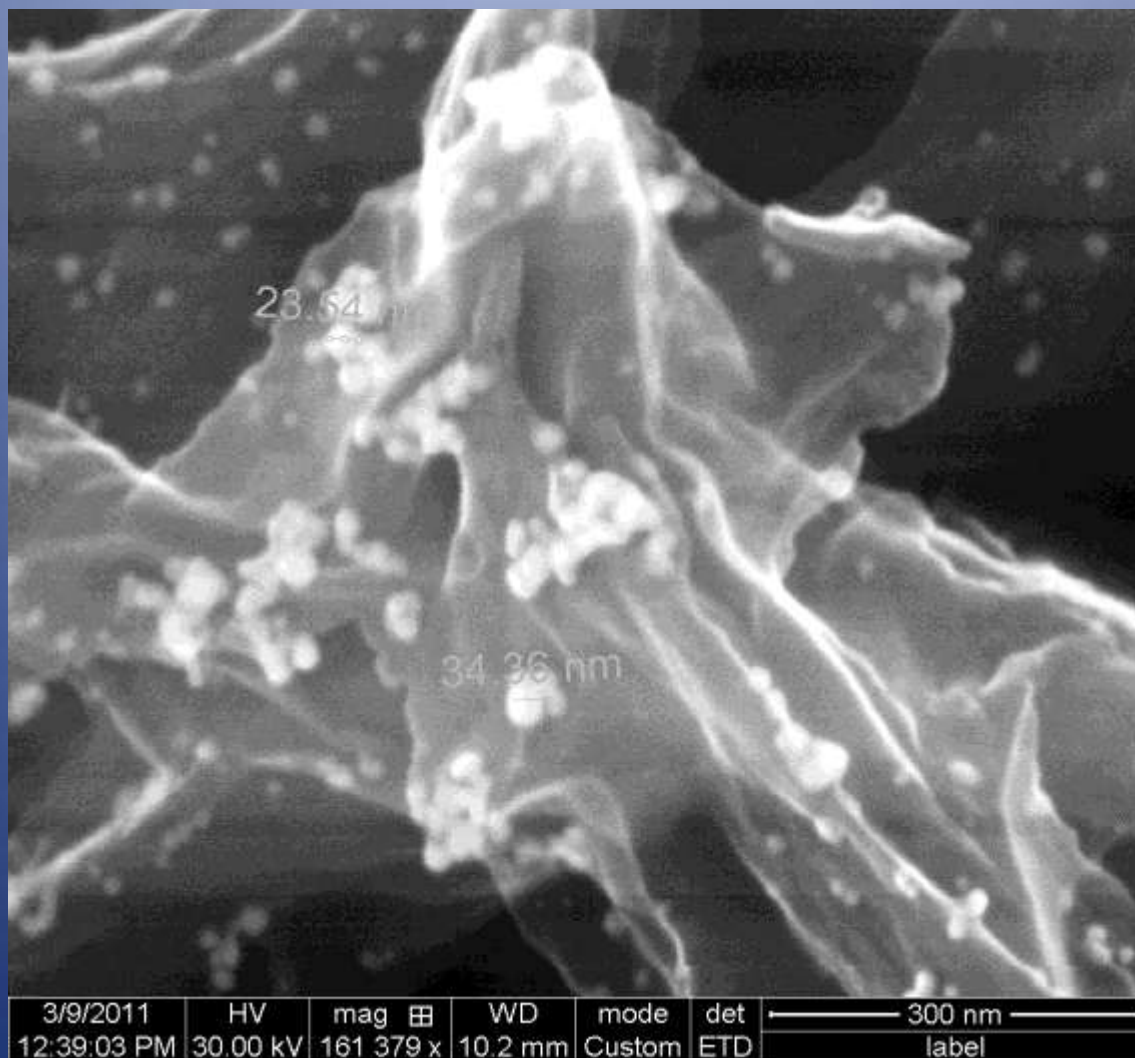
Mariánské Hory, 30.3.2011





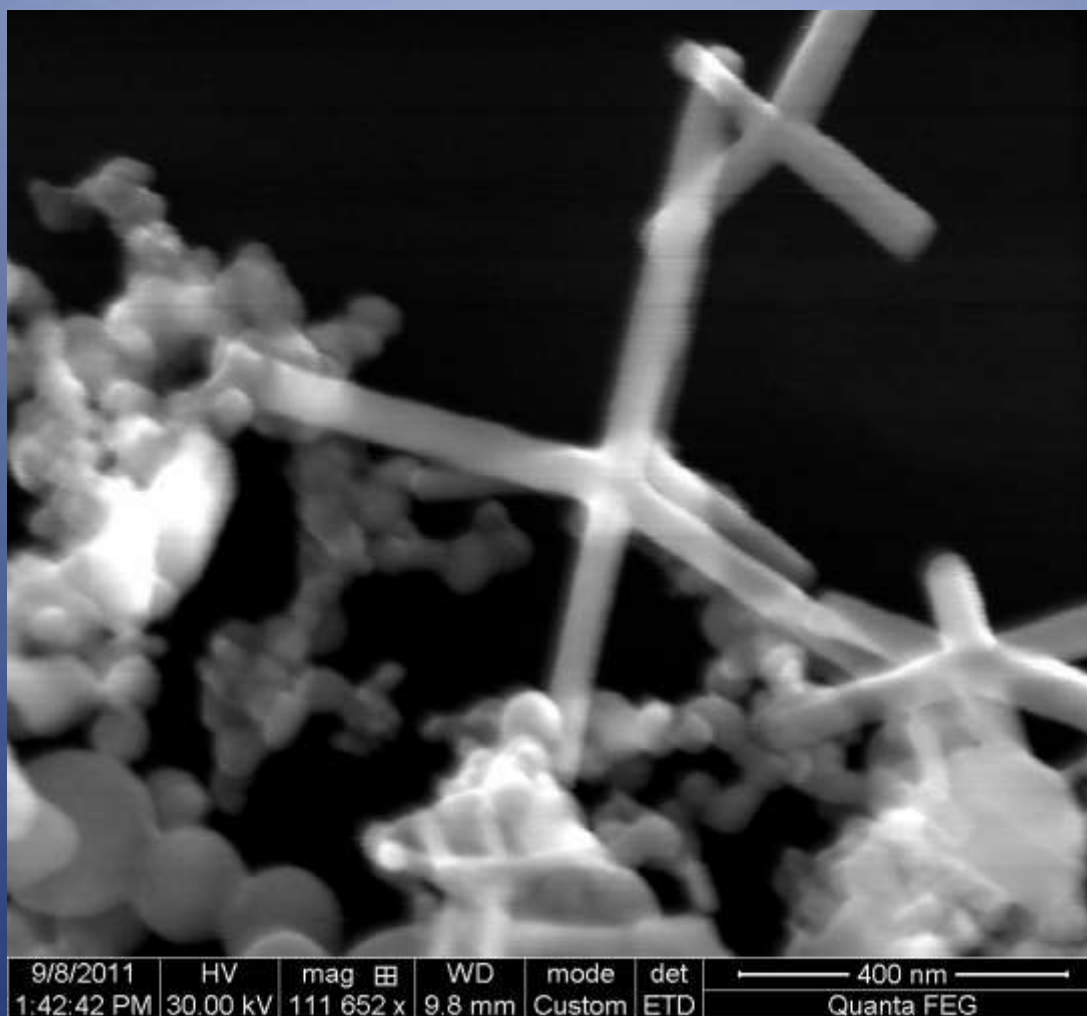


Nano-Ag zachycené na filtru 0,2 μ m



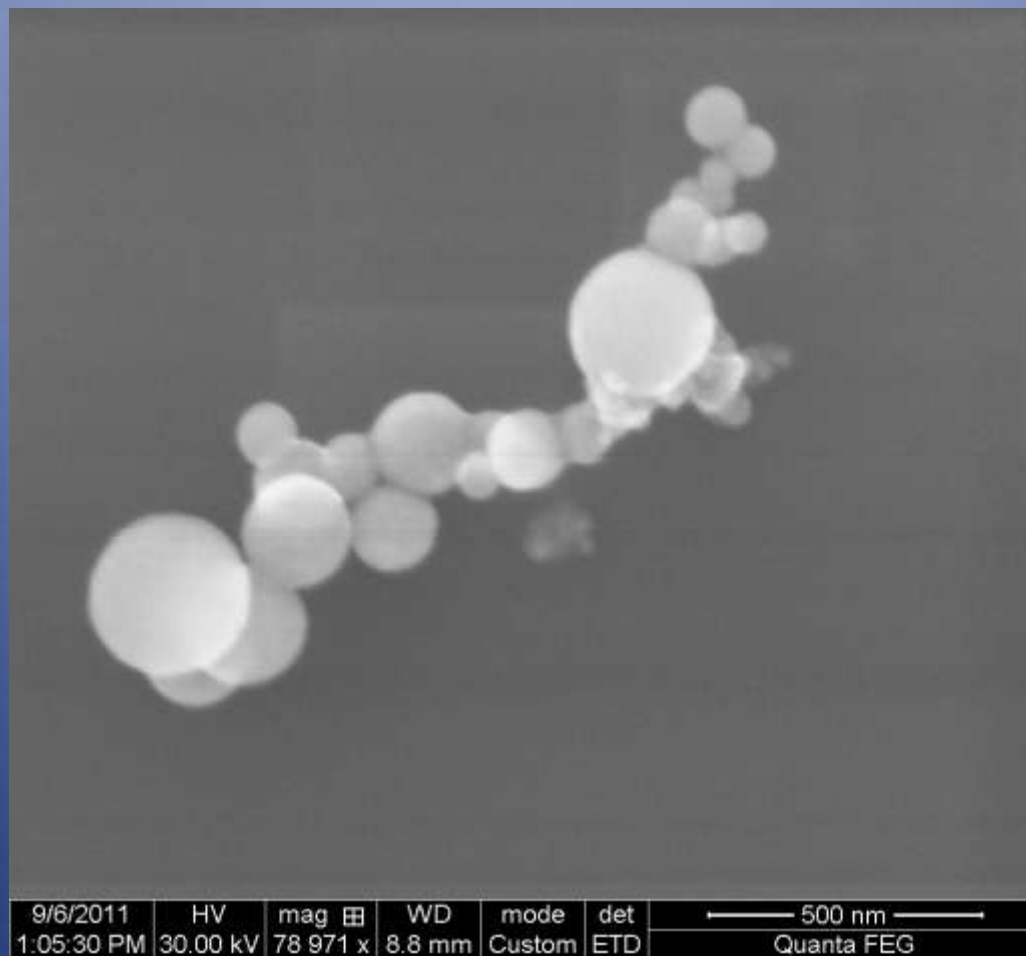


Částice Nano-Zn odebrané pomocí termického precipitátoru





Nanočástice oxidů Zn odebrané pomocí termického precipitátoru





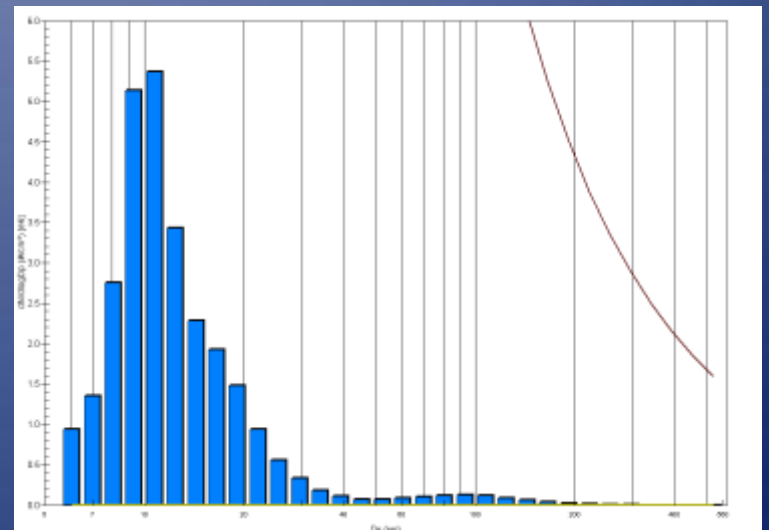
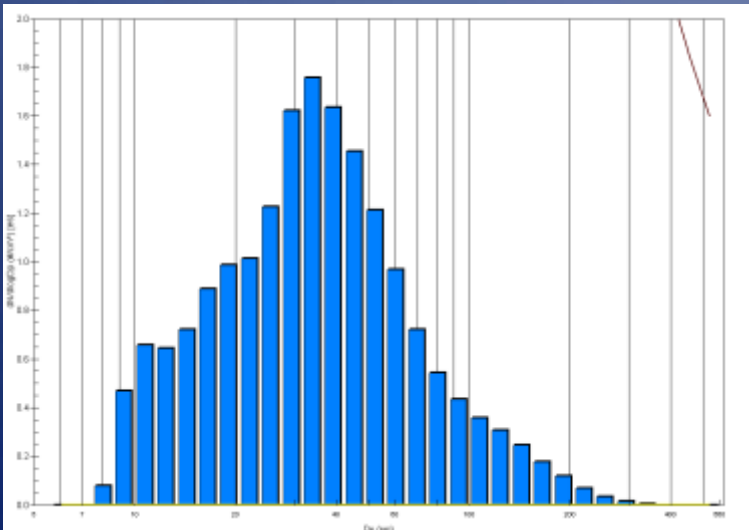
Pracovní prostředí



Broušení

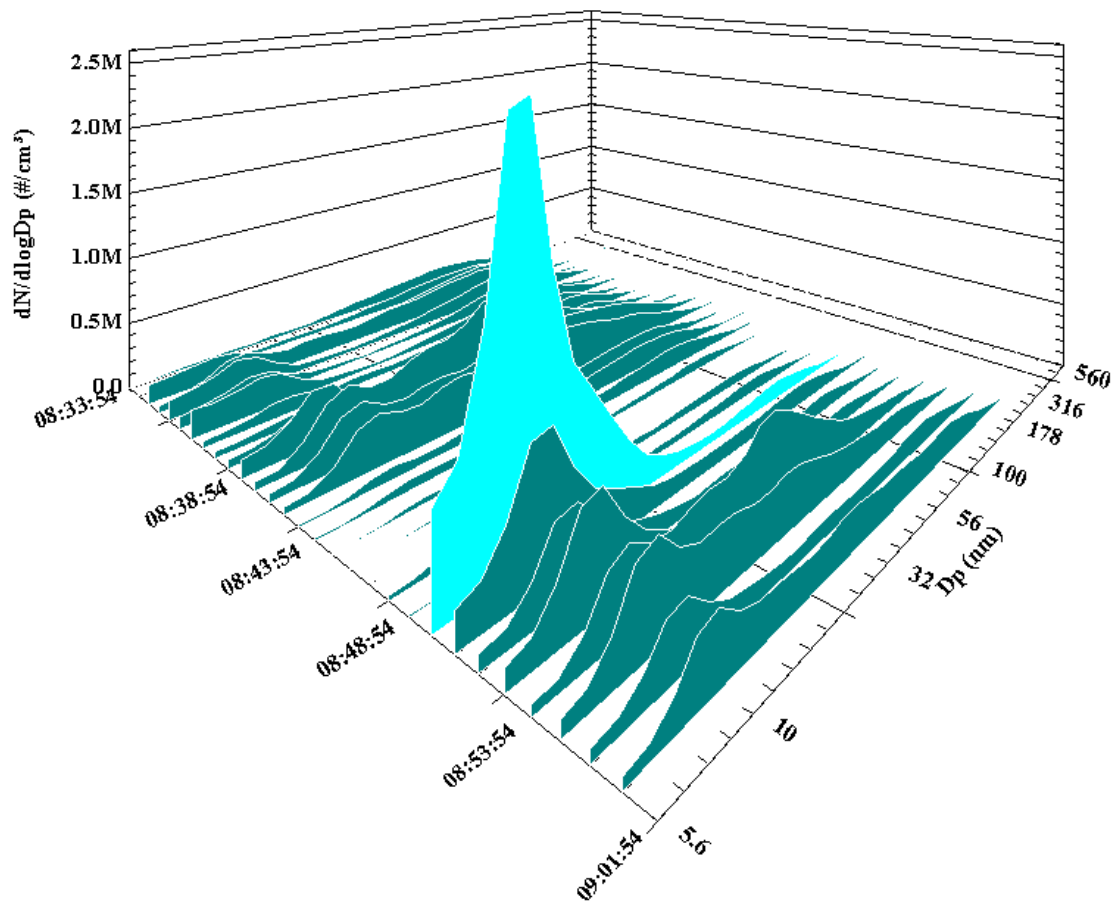


Svařování





Časový sled velikostních distribucí (08:33 – 09:01)





Děkuji za pozornost

