



H2020 NANOFASE

INERIS Contributions to WP6

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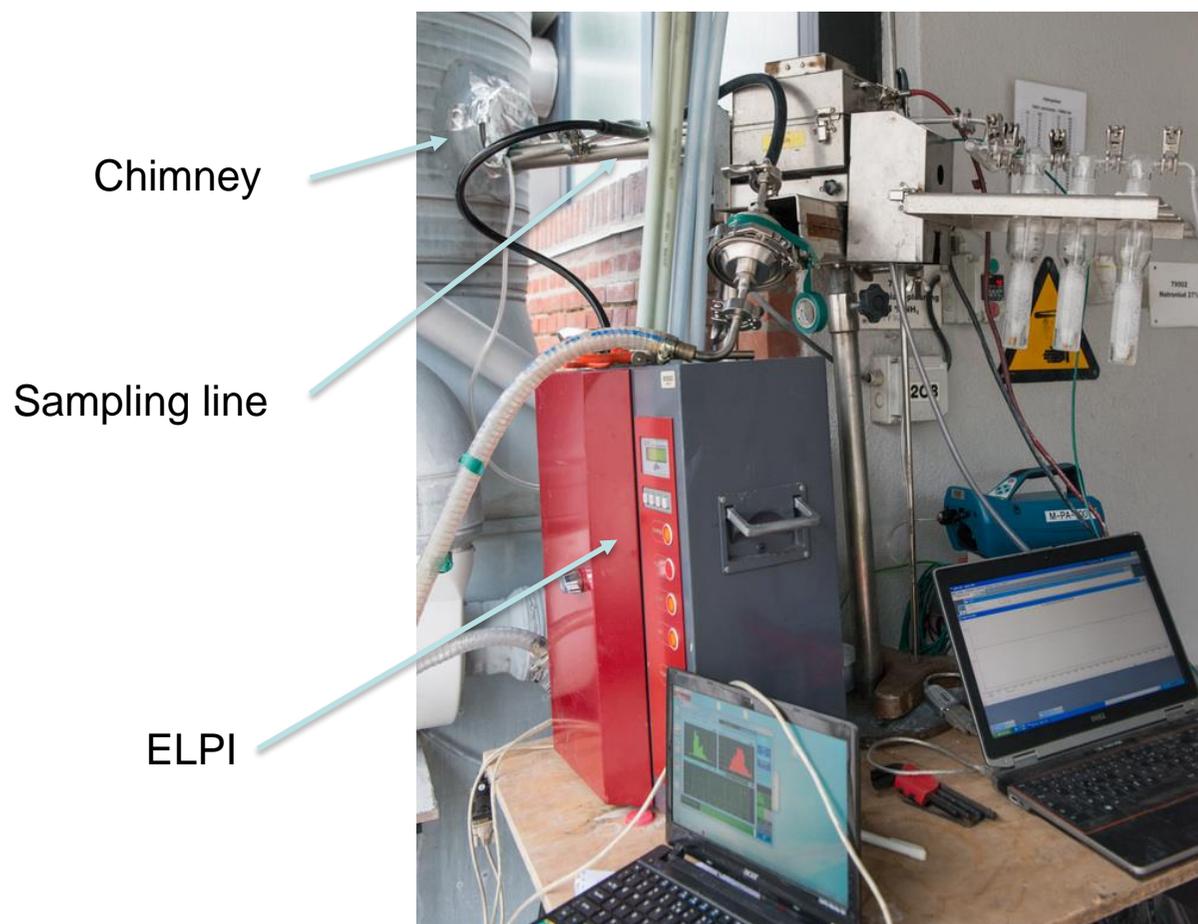
INERIS Involvement in WP6

Task 6.3 *Field test to determine ENM transformation and deposition under ambient conditions (M1-34)*

Overview of INERIS field campaign in Danish paint manufacturing site, February 2018)

- Dilution line (if necessary). Flowrate measurement
- DGI Impactor (size determination between 0.2 and 2.5 μm , and mass concentration of Ti versus size)
- 1 ELPI (number concentration vs size)
- MPS systems (morphology, chemical nature by TEM analysis)
- 1 CNC (total particulate concentration, monitoring of peaks)
- Quantitative TSP sampling (fluxes of each emitted substance in g/hour)

METHODOLOGY FOR STACK EMISSIONS



Environmental exposure : localisation of samplers



DA80 daily filter samplers



Emitters (two chimineas)



Deposition gauges



North

- 11 deposition passive gauges positioned on the site perimeter (1 month integrative sampling) : 1 month averaged ENM concentrations in atmospheric deposits (by elemental ICP/OES analysis)
- 2 high flowrate samplers DA 80 (Digitel) : 1 (ideally) under the plume, the other serving as reference point, giving one 720 m³ filter per day, during two weeks : 2x14 daily averaged ENM concentrations in air (ICP/OES)
- MPS and Nanobadge sampling (a few minutes for MPS, 1-2 hours for Nanobadge), several samplings per day (exposed and non-exposed) : morphology of particles, semi quantification of particle concentrations under the plumes.
- Meteorological station (mainly for wind direction and strength)

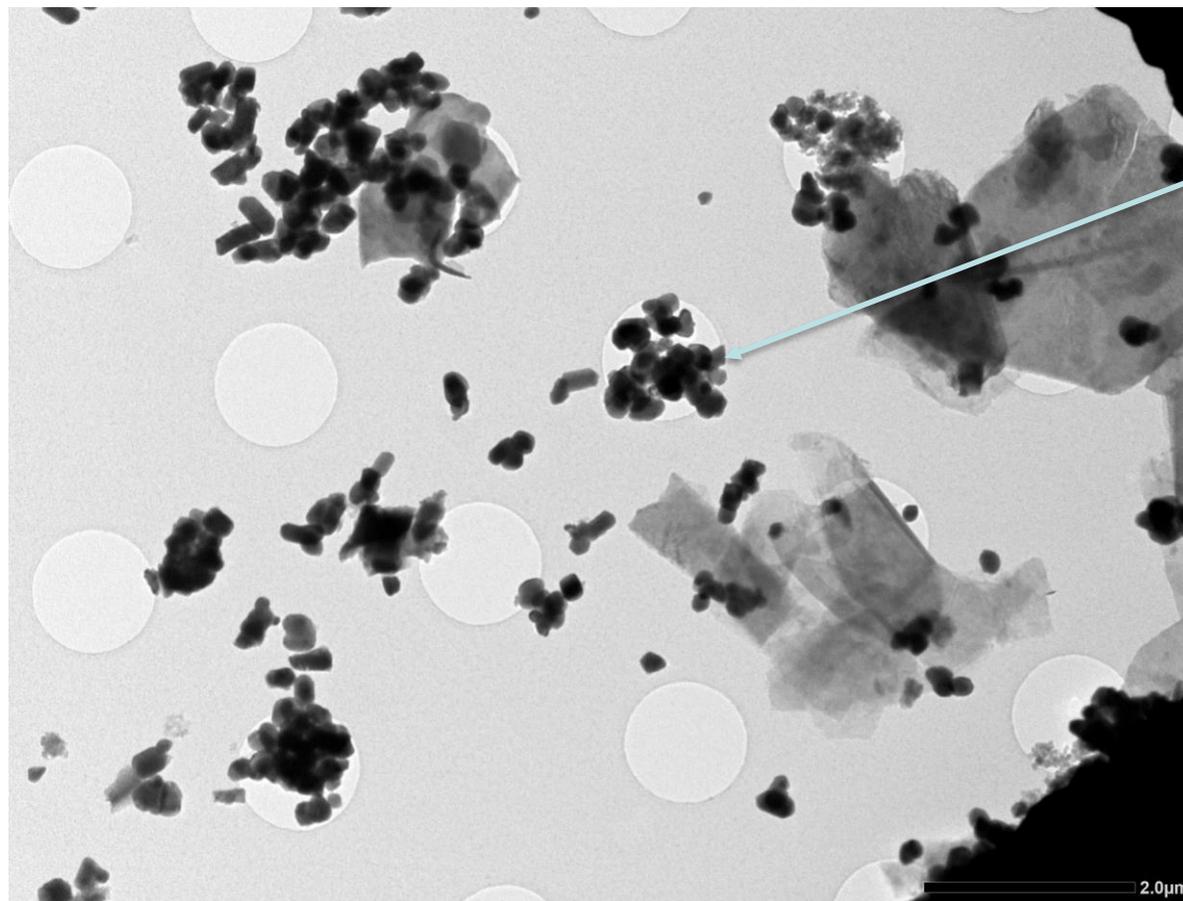
STACK EMISSIONS :

Mixing (big chimney) :

1 assay, 31-01, 07:33 to 12:43 : TiO_2 and talc pouring at the mixing station

- 5,8 g/h in TSP
- At a concentration of $0,55 \text{ mg/ m}_0^3$
- Particles sizes in the range 0.05 – 3 microns (ELPI)
- Relevant elements found : Si at $62 \text{ }\mu\text{g/ m}_0^3$, Ti at $28 \text{ }\mu\text{g/ m}_0^3$, Mg at $28 \text{ }\mu\text{g/ m}_0^3$, Ca at $24 \text{ }\mu\text{g/ m}_0^3$ and Al at $26 \text{ }\mu\text{g/ m}_0^3$
- Impossible to obtain individual substance emission (eg talc, kaolin, dolomite...) since these substances share several elements (Ca, Al, Si)

MPS samples examined in TEM (stack)

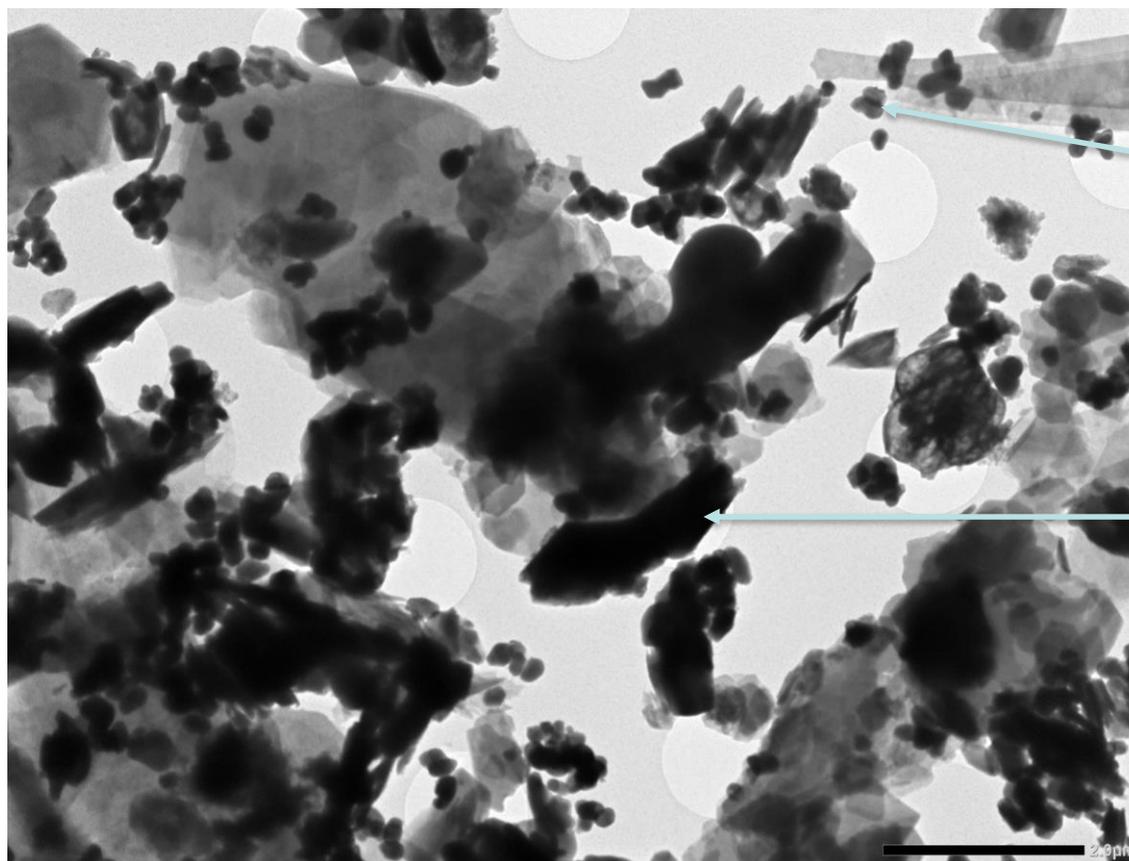


TiO₂ Pouring

TiO₂

Platelets : talc and kaolin

MPS samples examined in TEM (stack)



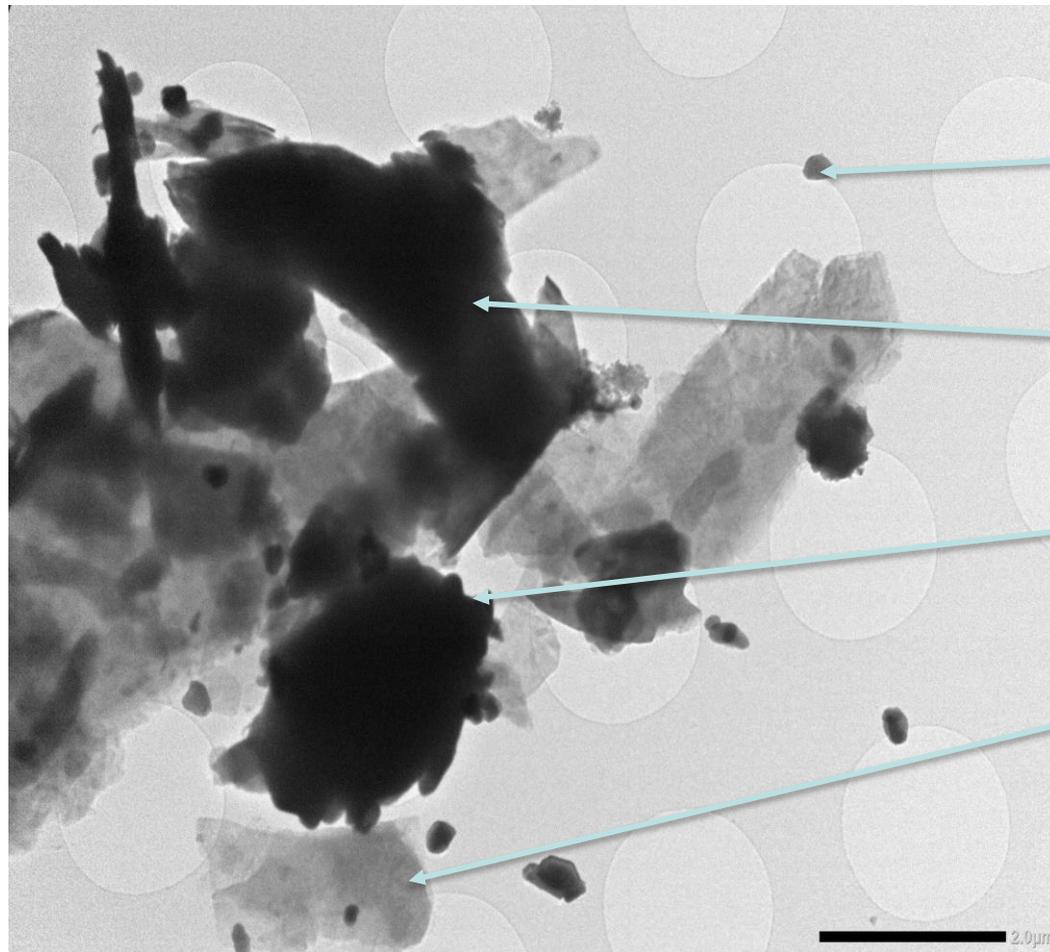
Clay pouring

TiO₂

Platelets : talc and kaolin

Clay : compact and thick particles

MPS samples examined in TEM (stack)



Clay pouring

TiO₂

Kaolin

Clay

Talc : platelets

Results : depository gauges ($\mu\text{g}/\text{gauge}$)

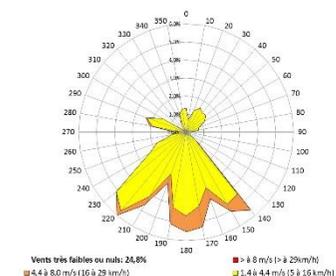
Gauge number	Al	Ca	K	Mg	Na	Si	Ti
blank 1	1,57	209	<LQ	8,34	5,76	19,4	<LQ
blank 2	1,01	22,9	<LQ	0,8	18,4	158	2,83
1	335	491	141	96,5	636	667	13,4
2	96,3	238	65,1	79	744	125	3,83
3	82,2	106	36,5	46	462	111	2,5
4	455	567	168	118	952	943	18,3
5	197	451	95,7	83,1	759	372	13,2
6	118	194	49,3	54	480	226	5,7
7	229	477	264	88,8	716	429	7,97
8	214	567	83,7	79,8	951	424	9,1
9	151	209	56,7	61,7	525	257	5,57
10	188	318	146	122	929	353	6,54
11	205	532	83,8	90	946	365	8,9
Quant. limit	0,5	0,5	5	0,5	5	5	1,25

In red : exposed according to meteo

In blue : non exposed

No clear difference between exposed and non-exposed.

→ Site contribution not clearly measurable



Results : daily filter samplers ($\mu\text{g}/\text{filter}$)

DA80	Date	Filter	Al	Ca	K	Mg	Ti
North	30-janv	18AD728	40	150	133	200	16,8
	31-janv	18AD729	30	100	64	140	15,2
	01-févr	18AD730	40	120	83	110	19,2
	16-févr	18AD731	50	160	124	170	11,3
	17-févr	18AD732	50	170	114	100	10,6
	18-févr	18AD733	30	120	116	90	10,3
	19-févr	18AD734	20	180	167	80	29,3
	20-févr	18AD735	50	140	115	40	11,8
	21-févr	18AD736	70	170	136	20	12,8
	22-févr	18AD737	70	210	124	40	12,5
	23-févr	18AD738	51	180	106	30	12,9
	24-févr	18AD739	40	100	49	30	10,4
	25-févr	18AD740	60	140	64	30	11,6
	26-févr	18AD741	120	290	109	50	15,0
	27-févr	18AD742	220	420	141	80	19,3

In red : exposed according to meteo

In blue : non exposed

No clear difference between exposed and non-exposed,

→ Site contribution not clearly measurable