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# Airborne PM generated from handling of crushed carbon nanotube-enhanced concrete

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Concrete = water + cement + agglomerates

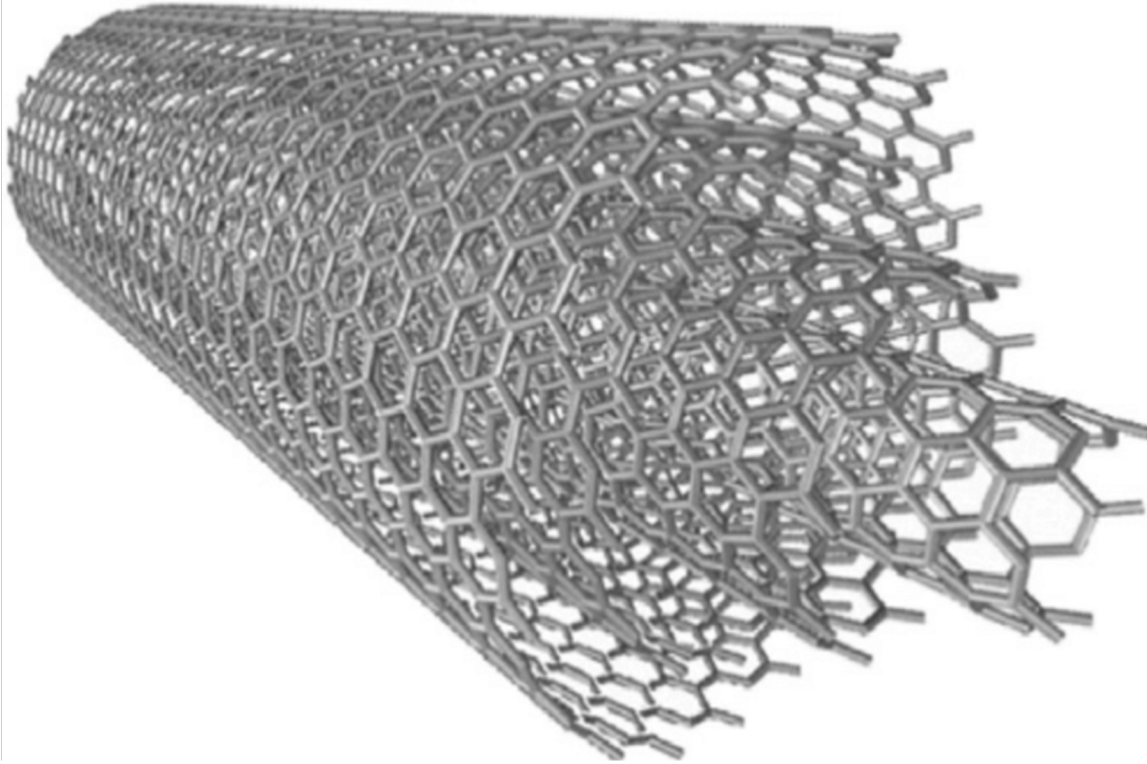


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# Why?

- Common
- Demolition work associated with high levels of PM exposure
- Climate effects
- Proactive





# MWCNT

- Increases strength
- Densifies the matrix
- Bridging micro-cracks
- Self-sensing



# Study aim

Through standardized resuspension in a lab setting and sampling of the resulting aerosol, the impact of concrete type, MWCNT concentration and the resulting interaction of the two, on PM formation, is investigated.

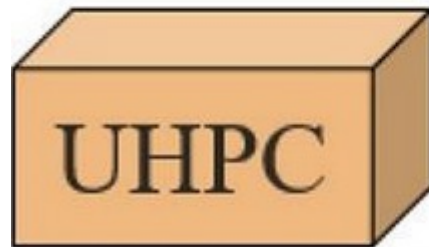




$\rho: 0.3 \text{ g/cm}^3$

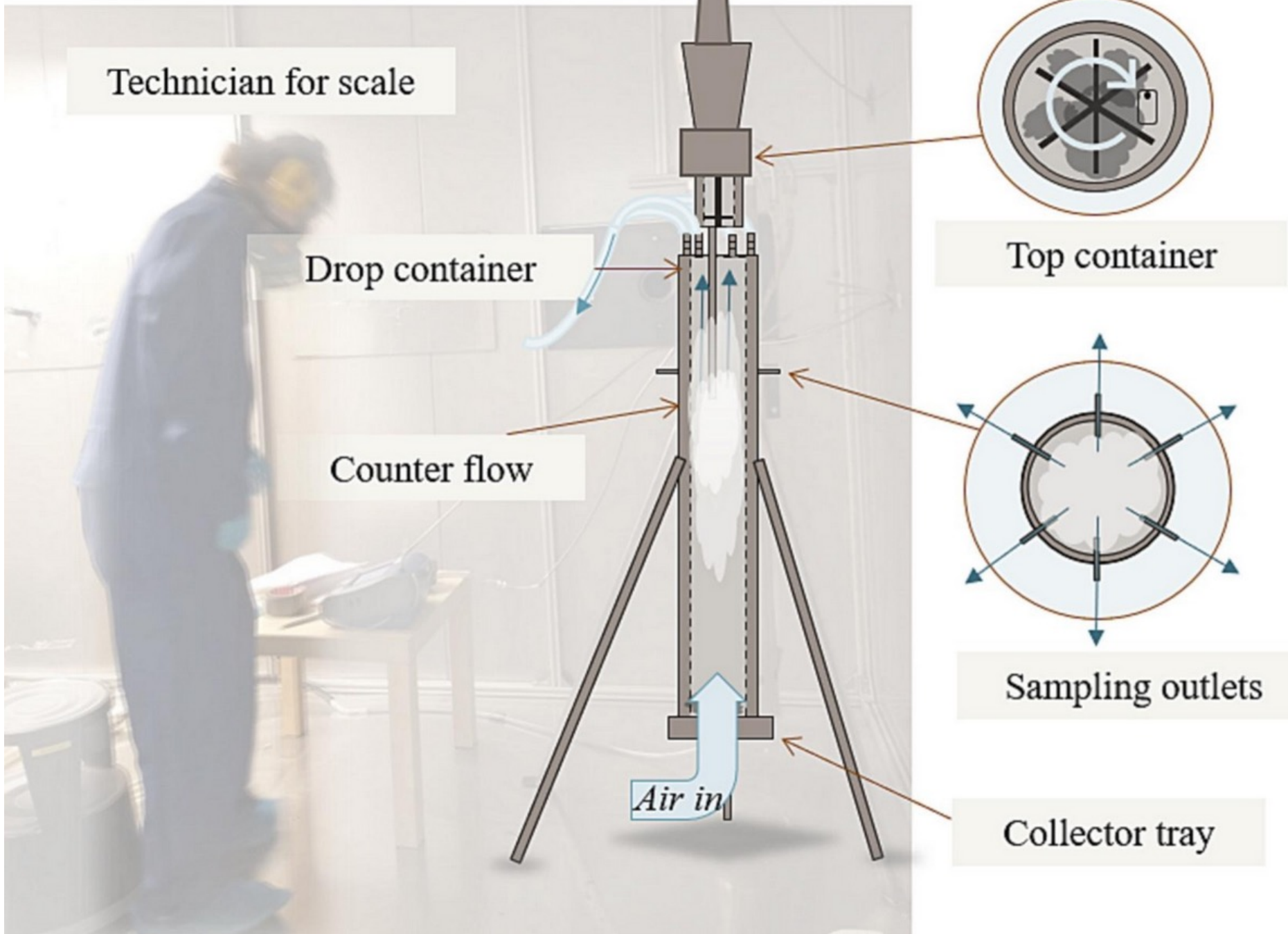


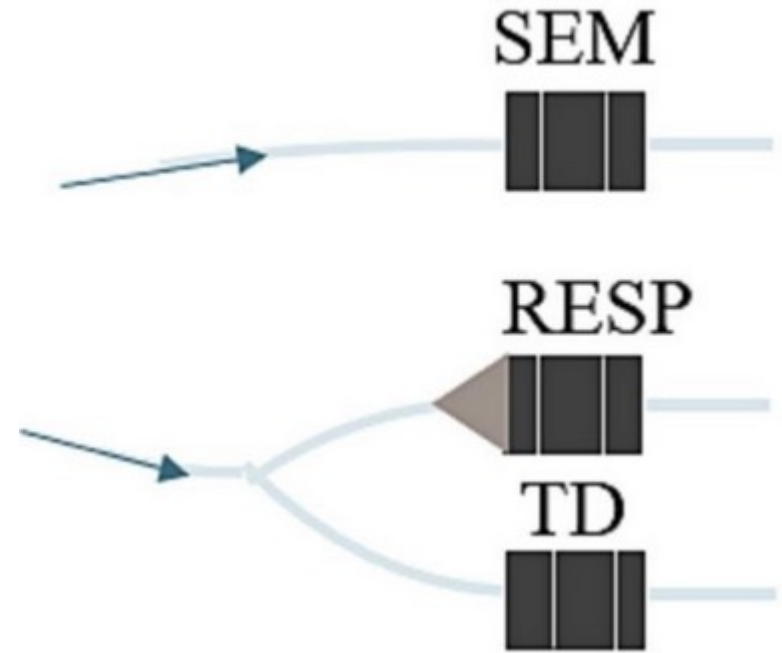
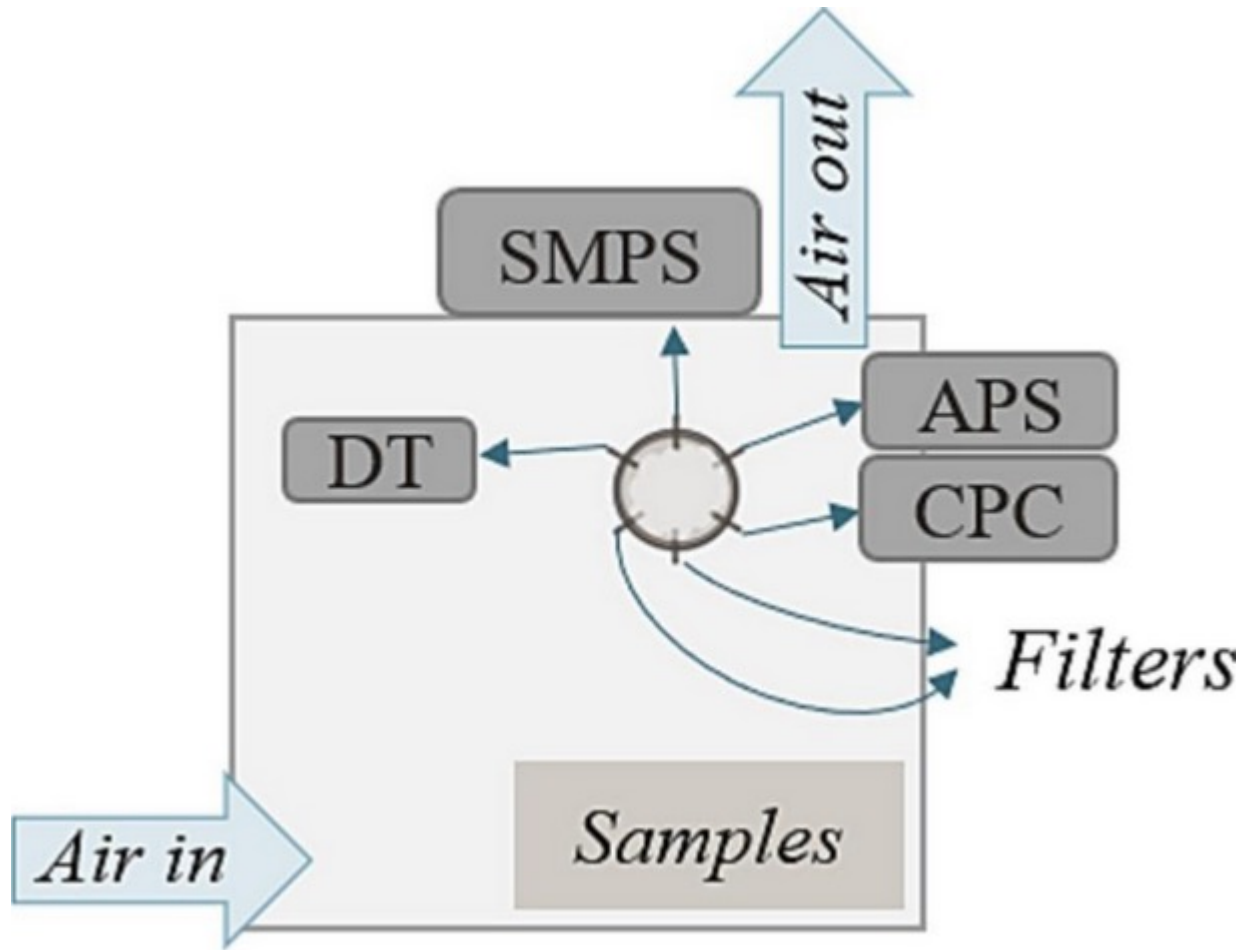
$\rho: 2.2 \text{ g/cm}^3$



$\rho: 2.35 \text{ g/cm}^3$



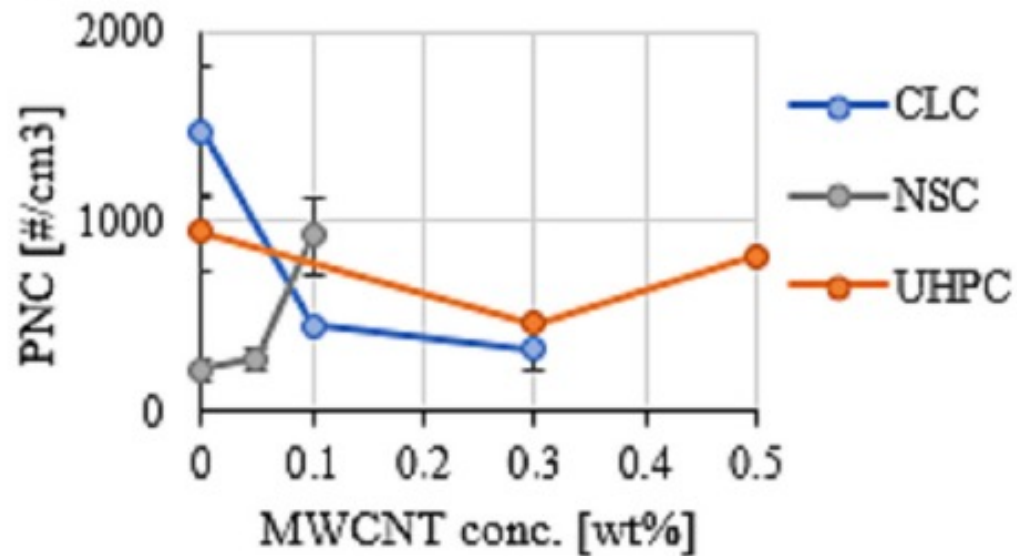




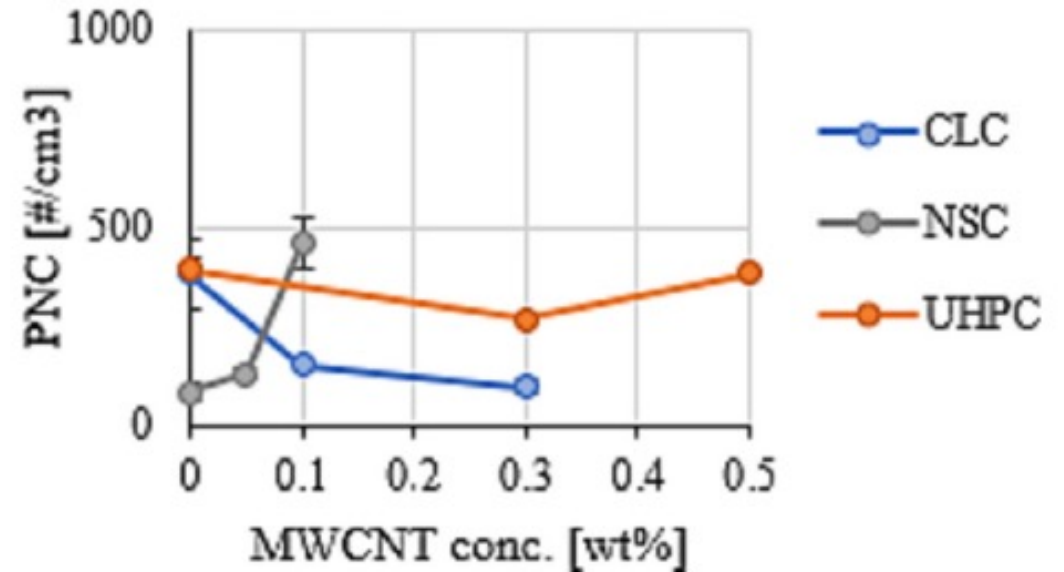


# Particle number concentrations

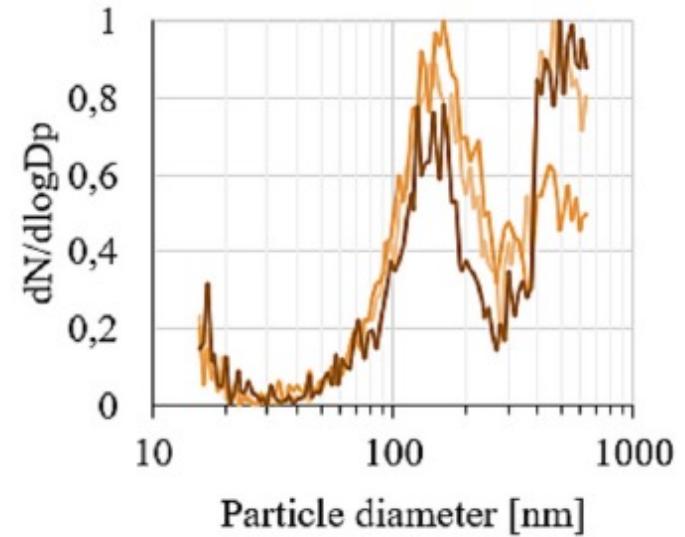
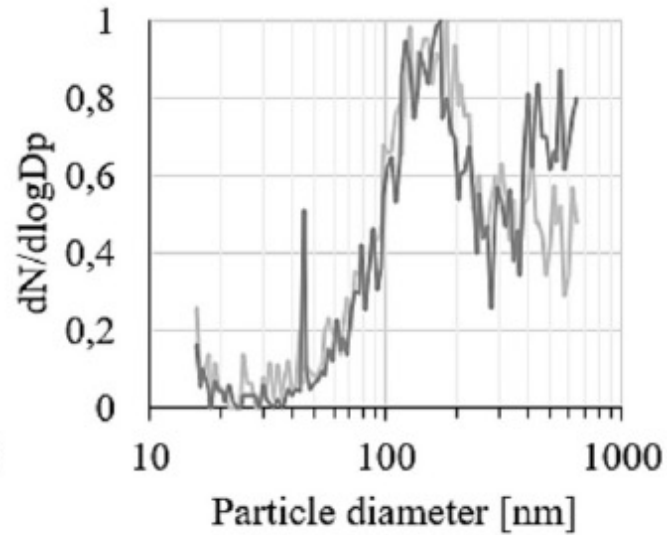
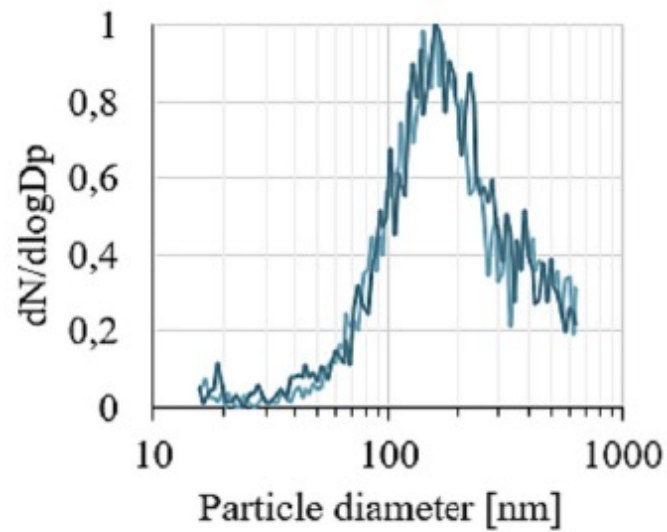
7-2000 nm (CPC)



0.5–20 μm (APS)



# Size distributions



— CLC 0.1 GMD:  $154 \pm 2$  nm,  $\sigma$ : 1.5

— CLC 0.3 GMD:  $157 \pm 5$  nm,  $\sigma$ : 1.6

— NSC 0 GMD:  $156 \pm 11$  nm,  $\sigma$ : 1.7

— NSC 0.05 GMD:  $144 \pm 4$  nm,  $\sigma$ : 1.7

— UHPC 0 GMD:  $146 \pm 5$  nm,  $\sigma$ : 1.4

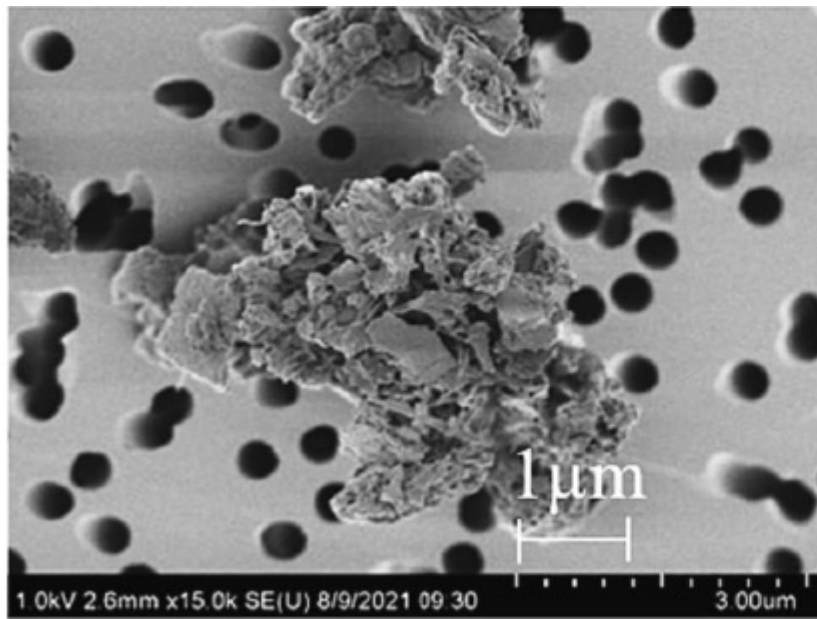
— UHPC 0.3 GMD:  $149 \pm 2$  nm,  $\sigma$ : 1.5

— UHPC 0.5 GMD:  $145 \pm 2$  nm,  $\sigma$ : 1.4

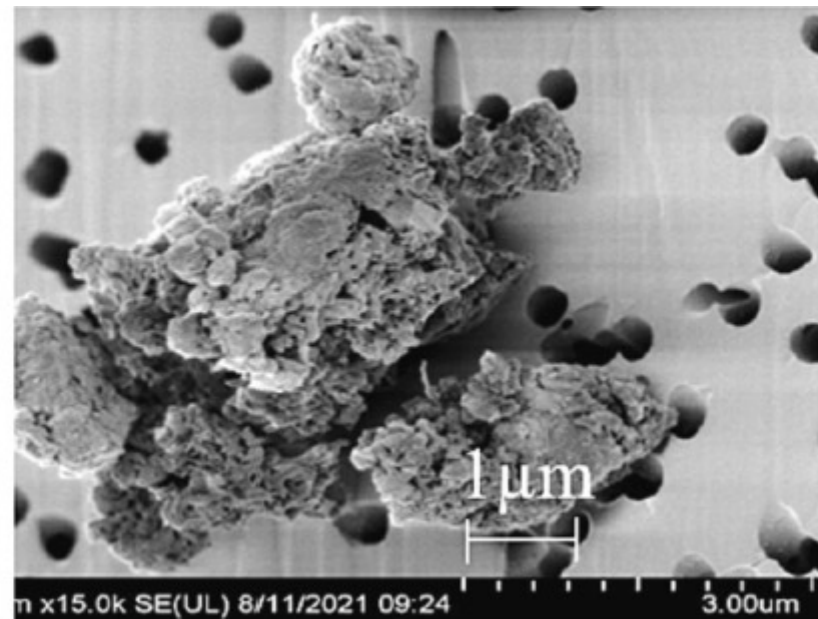


# PM morphology

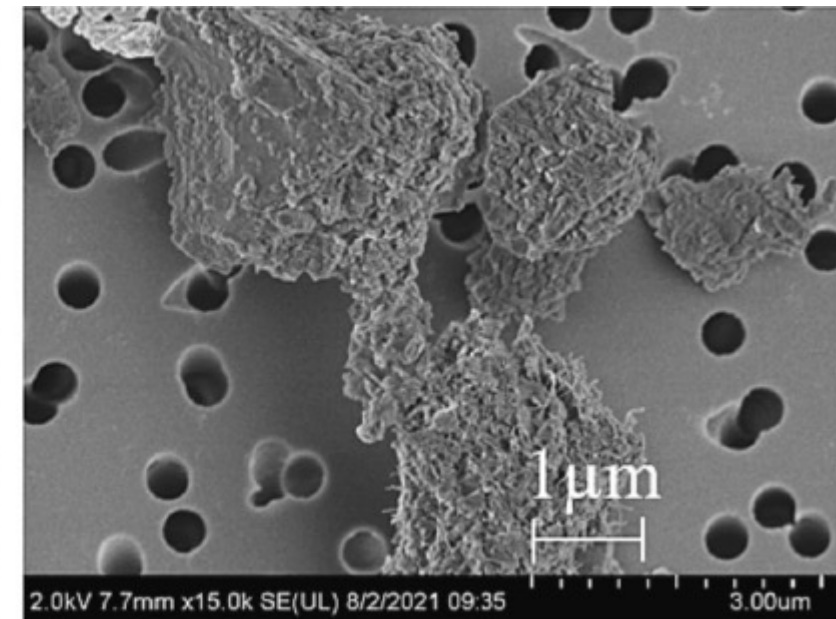
## CLC



## NSC

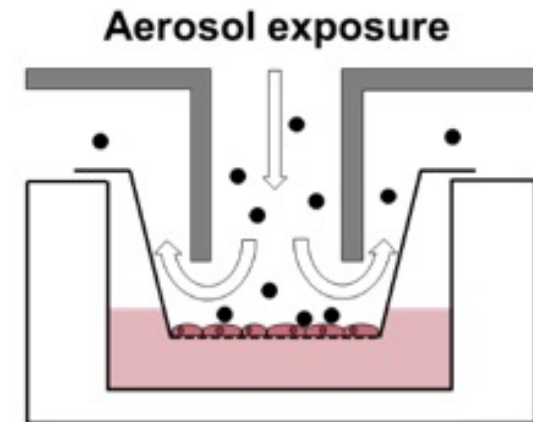
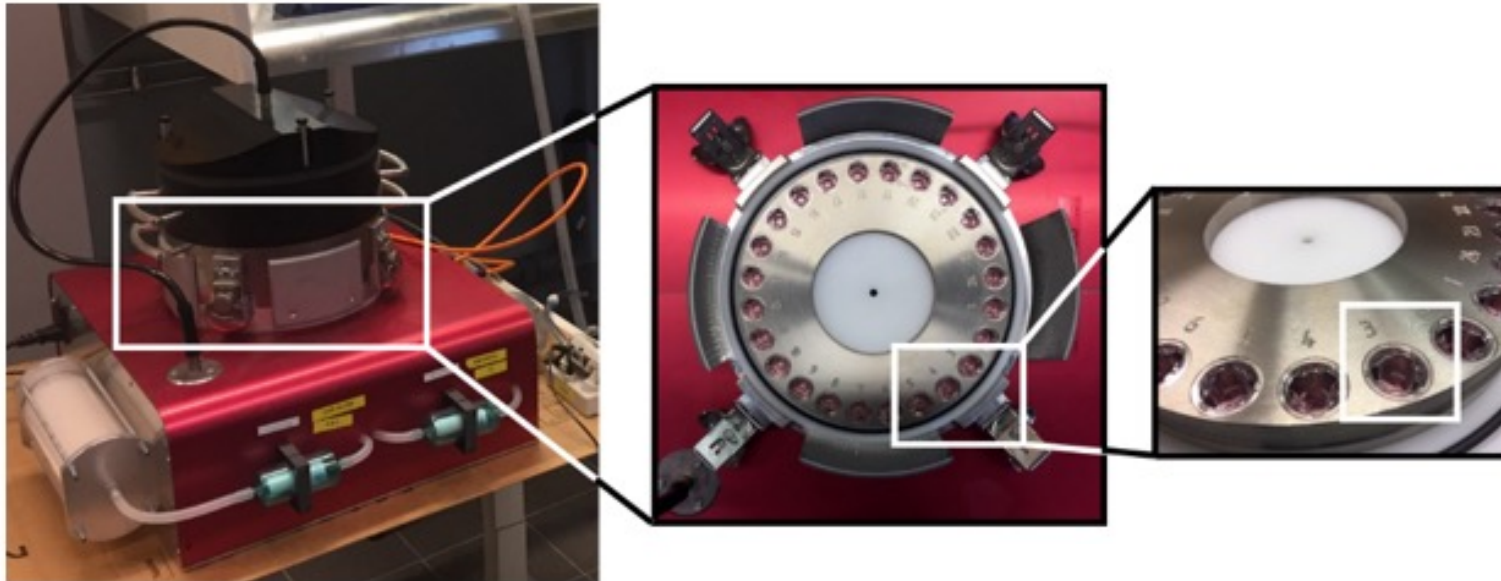


## UHPC

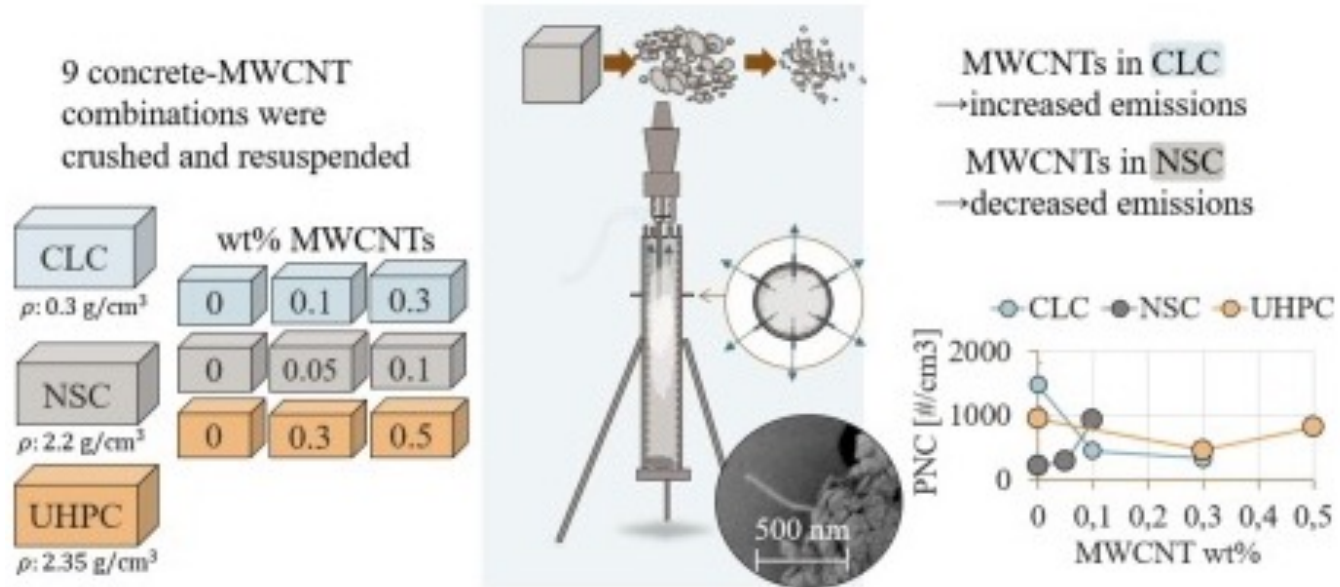


# What now?

- MWCNT and nano-TiO<sub>2</sub>, at different T & RH
- Enrichment of ENP in certain PM size ranges?
- In-vitro toxicity



# Thank you!



Abrahamsson C. et al. NanoImpact 2024



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