

## Background

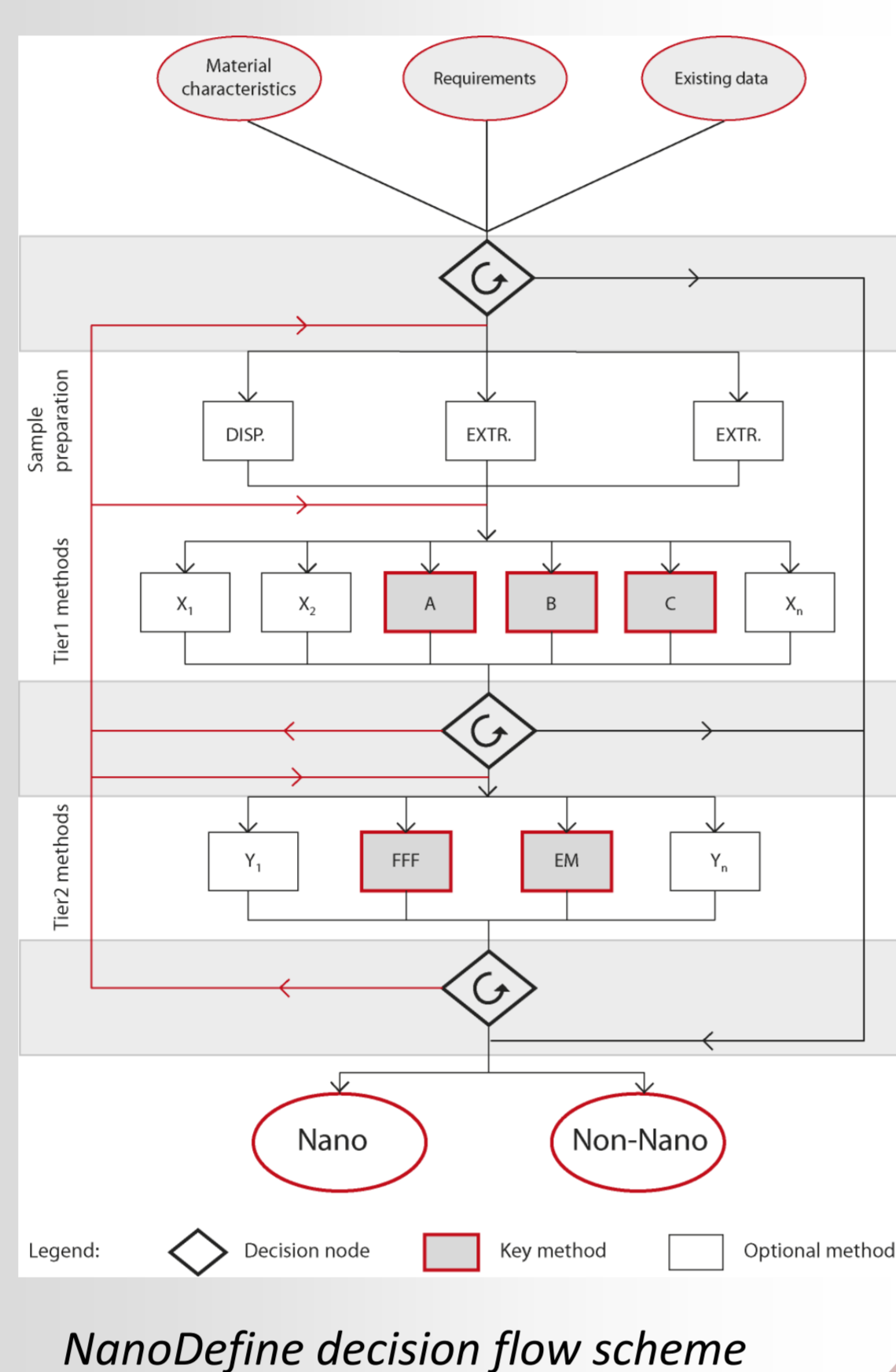
- In 2011, the European Commission published a recommendation on the definition of nanomaterial.
- The definition will be implemented in various regulatory contexts, e.g. REACH, cosmetics regulation.
- Analytical methods are required that determine reliably particle size and number based size distribution.

## Goals

- Sourcing and characterisation of real world test materials (industrial raw materials, products)
- Comparative evaluation of techniques
- Development, validation, standardisation of key methods; instrument + software improvements
- Guidance to end-users

## Concept

- Tiered approach
  - Tier 1: robust, cost-efficient, widely available methods
  - Tier 2: sophisticated, for complex samples.
- NanoDefiner e-tool
  - intelligent decision flow scheme for selection of methods, evaluation of results and classification according to the EC definition



## Test materials

- Inorganic: CaCO<sub>3</sub>, BaSO<sub>4</sub>, TiO<sub>2</sub>, nano-steel, kaolin, zeolite, MWCNT
- Organic: pigment yellow, basic methacrylate polymer
- Products: Cosmetics (TiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>), food (SiO<sub>2</sub>), plastics
- Pre-characterisation completed, Full characterisation (including homogeneity, stability) ongoing

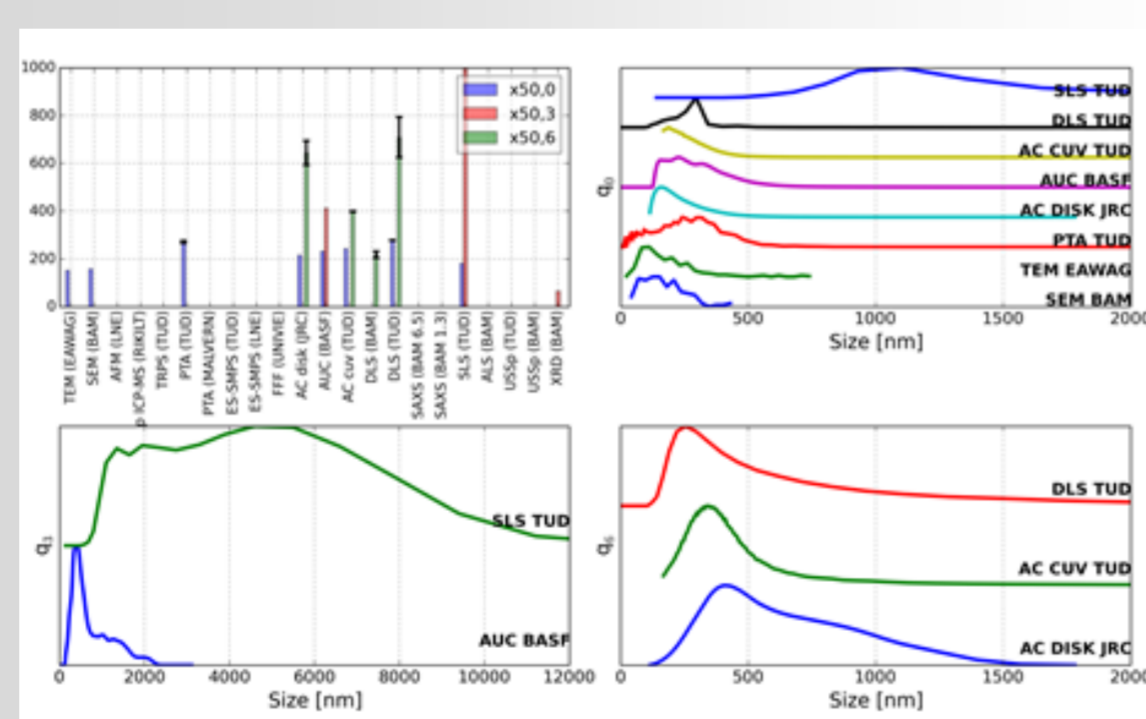


## Technique evaluation

- Theoretical and experimental technique evaluation completed
- VSSA as screening tool compared to EM results
- Algorithms for more reliable conversion to number metrics developed

	TEM	SEM	ICP	PTA	DEMS	FFF	AC4	AC6	AUC	DLS	SAXS	ALS	USSP	XRD	BET
ID-19 (PCL mono)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ID-20 (PCL 3nm)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ID-17 (PDS)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ID-18 (SiO <sub>2</sub> 3nm)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
mem384 (CaCO <sub>3</sub> )	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
mem387 (BaSO <sub>4</sub> )	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
mem381 (BaSO <sub>4</sub> )	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
mem388 (TiO <sub>2</sub> )	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
mem385 (kaolin)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
mem383 (zeolite)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
mem382 (CNT)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
mem380 (YSZ)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
mem386 (YSZ)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
mem389 (BMA)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BAM-11 (zeolite)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
mem384-02	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ID-16 (nano-Au)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
mem-kg	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

*overview of technique evaluation (✓: measured, x: not applicable to material)*



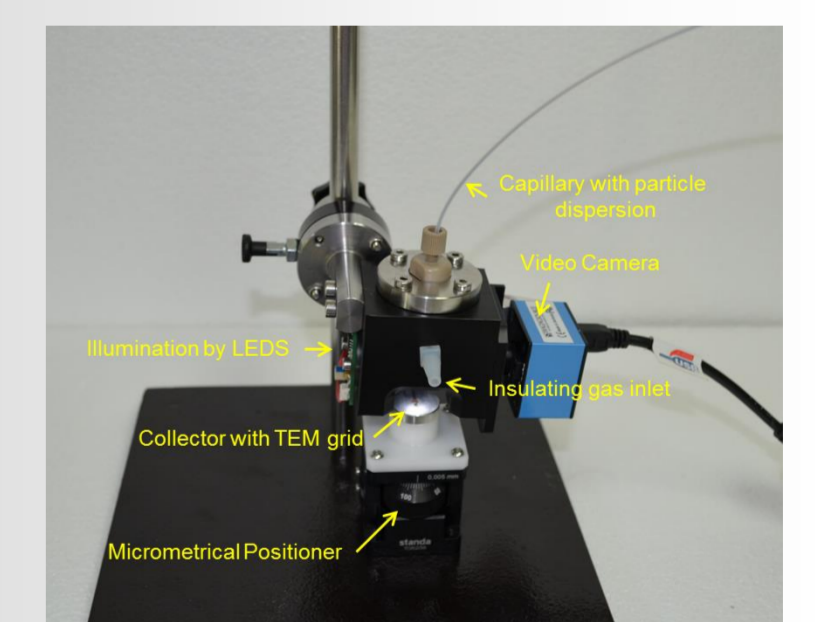
*particle size distribution of CaCO<sub>3</sub> obtained by different techniques*

## Instrument & method development

- Dispersion protocols developed for several materials
- Instrument and software prototypes developed
- Analytical method development ongoing for counting (EM, PTA, spICP-MS, SMPS) and fractionation (CLS, AUC, FFF) techniques



*prototype of HR-SMPS instrument for very small particles*



*electrospray deposition system for TEM grids*

## NanoDefine Products

- The NanoDefiner e-tool
- The NanoDefine Methods Manual
- Standard operation procedures (SOPs)
- Reference materials
- Instrument prototypes and software
- CEN/ISO standards (work items)
- Technology transfer to end users

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