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# amc technical briefs

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## The characterisation of nanoparticles

Nanoparticles are of current interest because of an emerging understanding of their possible effects on human health and environmental sustainability, and owing to the increasing output of man-made nanoparticles into the environment. Nanoparticles are used in many different applications and created by many different processes. Their

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**Table 1.** Comparison of the properties of nominally spherical nanoparticles and their likely penetration into the human respiratory system. Particle size has a dramatic effect on the physical properties of a collection of particles. Mass-based measurements are heavily weighted towards the largest particles, whereas smaller particles have a much larger surface area per unit mass.

Particle Diameter (nm)	Relative Mass
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### ***Gas Phase (Aerosols)***

Nanoparticles in the gas phase may be monitored using a range of commercially available and relatively low cost equipment. Generally, these instruments are quite robust and can be used for prolonged periods with little attention. They are also generally resistant to matrix effects. However, relative humidity and volatile organic species can sometimes affect measurements. Unlike the condensed phases, aerosols cannot be stored for later analysis and so reproducible sampling is very important. A range of inlets has been designed for different applications to reduce inconsistencies in this respect.

- *'Concentration'*: usually expressed as a number concentration or mass concentration. The latter will strongly weight the distribution curve in favour of larger particles - a single 10  $\mu\text{m}$  diameter particle weighs the same as 1 million 100 nm particles!
- *Size*: there are many methods for measuring particle size but comparability between them is a problem. They include optical and aerodynamic methods, but these give no information about variations in morphology.
- *Surface area*: There are few routine surface area techniques available. The most common involves charging the aerosol using a corona discharge and measuring the charge concentration. Such methods are usually calibrated against size distribution measurements.
- *Charge*: collisions of air ions with particles result in a steady state charge distribution. This distribution is

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