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background paper

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What is uncertainty from sampling, and why is it important?

When end-users of data pay for analysis they want to find out one or more useful properties of a particular quantity of material, the target. They might want to know the average tungsten content of a consignment of tungsten ore, sor

corre s o . his rade o f ets estimate a level of uncertainty that minimises the total losses (o sts of analysis plus cost of mistakes) in th e long term Such an optimal uncertainty is called fit for purpose'.

tainty. (T he loose term fn argin of error' conveys a rough idea of what analytical chemists mean by the exactly defined term tnce rtainty:) Moreover, the uncertainty has two distinguco co

Sampling

We cannot usually analyse the whole targeta 3.847 48.2608 Tm(i 0 0 5 19y T

led *in situ* or sent to the laboratory for analysis. As the customer wants to know about the composition of the target, the ideal outcome of the sampling process is that the overall composition of the sample is the same as that of the target. In most areas of endeavour, there are carefully devised protocols for taking samples, which result in what is known as a 'representative' sample.

Uncertainty from sampling

But even the best protocols, perfectly executed, cannot produce a *perfectly* representative sample: samples never have exactly the same average composition as the target. (Well, hardly ever: nearly all targ

An illustration

Figure 1 shows an array of ‘particles’ (depicted as circles) of which 10% are b0 10.02 102.8822 7.850are