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measurement result

Also contains definitions of: bias, expectation value, expected value, limiting mean

The outcome of an analytical measurement (application of the chemical measurement process), or value attributed to a measurand. This may be the result of direct observation, but more commonly it is given as a statistical estimate derived from a set of observations. The distribution of such estimates (estimator distribution) characterizes the chemical measurement process, in contrast to a particular estimate, which constitutes an experimental result. Additional characteristics become evident if we represent $\hat{x}$ as follows:

$$\hat{x} = \tau + e = \underbrace{\tau}_{\mu} + \overbrace{\underbrace{\Delta}_{} + \delta}^{e} = \mu + \delta$$

The true value, τ, is the value x that would result if the chemical measurement process were error-free. The error, e, is the difference between an observed (estimated) value and the true value; i.e. $e = \hat{x} - \tau$ (signed quantity). The total error generally has two components, bias (Δ) and random error (δ), as indicated above. The limiting mean, μ, is the asymptotic value or population mean of the distribution that characterizes the measured quantity; the value that is approached as the number of observations approaches infinity. Modern statistical terminology labels this quantity the expectation value or expected value, $E(\hat{x})$. The bias, Δ, is the difference between the limiting mean and the true value; i.e. $\Delta = \mu - \tau$ (signed quantity). The random error, δ, is the difference between an observed value and the limiting mean; i.e. $\delta = \hat{x} - \mu$ (signed quantity).

Source:
PAC, 1995, *67*, 1699 *(Nomenclature in evaluation of analytical methods including detection and quantification capabilities (IUPAC Recommendations 1995))* on page 1705

