

measurement result

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:

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

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).

1995, 67, 1705