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Rayleigh ratio

The quantity used to characterize the scattered intensity at the scattering angle θ, defined as $R(\theta) = \frac{i_\theta r^2}{I f V}$, where I is the intensity of the incident radiation, i_θ is the total intensity of scattered radiation observed at an angle θ and a distance r from the point of scattering and V is the scattering volume. The factor f takes account of polarization phenomena. It depends on the type of radiation employed.

1. For light scattering, dependent on the polarization of the incident beam, $f = 1$ for vertically polarized light, $f = \cos^2\theta$ for horizontally polarized light and $f = \frac{1 + \cos^2\theta}{2}$ for unpolarized light.
2. For small-angle neutron scattering, $f = 1$.
3. For small-angle X-ray scattering, $f \approx 1$, if $\theta <$ ca. 5 °.

Notes:

1. The dimension of $R(\theta)$ is $(\text{length})^{-1}$.
2. In small-angle neutron scattering the term cross-section is often used instead of $R(\theta)$; the two quantities are identical.
3. An alternative recommended symbol is R_θ.

Source:
Purple Book, p. 65

