**rotational correlation time, \( \tau_c \) or \( \theta \)**

Parameter describing the time dependence of the tumbling of a molecular entity in a medium of viscosity \( \eta \). The rotational correlation time can be obtained from the decay of the fluorescence or phosphorescence anisotropy and is related to the average molecular rotational diffusion coefficient, \( D_r \), in turn related to the hydrodynamic molecular volume of the fluorophore, \( V \), and to \( \eta \) (see Note 3).

Notes:

1. Mathematical definition: \( r(t) = r_0 \exp(-\frac{t}{\tau_c}) \) with \( r(t) \) the emission anisotropy at time \( t \) and \( r_0 \) the fundamental emission anisotropy.
2. In the case of a spherical emitting species reorienting itself in a homogeneous fluid, \( \tau_c = \frac{1}{6D_r} \).
3. Often, the Stokes–Einstein relationship is used for the calculation of \( D_r \), i.e., \( D_r = \frac{RT}{6V\eta} \) with \( R \) the gas constant, \( T \) the absolute temperature and \( V \) the hydrodynamic molecular volume. However, the use of this relationship at a molecular level is questionable, and \( D_r \) should be independently determined by time-resolved fluorescence polarization methods. Compare with rotational relaxation time.

**Source:**