

# Spatio-temporal heterogeneity in octanol rich region: Revealing via time resolved fluorescence measurements

Narayan Chandra Maity, Ranjit Biswas

SNBNCBS, JD Block, Sector 3, Salt Lake, Kolkata-700106, India  
narayanmaity8145@bose.res.in/narayanmaity8145@gmail.com

## Abstract

Neat 1-octanol and wet-octanol has been the subject of numerous studies due to their property of membrane mimics.<sup>1-3</sup> Interaction and dynamics as well as solution heterogeneity aspect pure octanol and water/octanol mixtures have been investigated via steady state and time-resolved fluorescence (TRF) measurements in the temperature range of  $283 \leq T/K \leq 323$  with various mole fraction of water in the octanol rich region. Coumarin 153 (C153)<sup>4</sup>, Coumarin 343 (C343)<sup>5</sup>, trans-2-[4'-(dimethylamino)styryl]benzothiazole (DMASBT)<sup>6</sup> fluorophores have been employed as local reporters to investigate relaxation dynamics in this aqueous mixture in presence of reactive and non-reactive fluorophores. Excitation wavelength dependence of fluorescence emissions<sup>7,8</sup> suggest that the neat and aqueous binary mixtures, within the lifetime DMASBT ( $\langle \tau_{life} \rangle \sim 0.5$  ns), are spatially heterogeneous.<sup>9</sup> Solute-medium frictional coupling in neat and wet-octanol have been further explored *via* time-resolved fluorescence anisotropy studies of the two non-reactive fluorophores, C153 and C343. In spite of nearly similar size, rotational diffusion of C153 exhibits fractional viscosity dependence while C343 nearly follows the Stoke-Einstein-Debye model.<sup>10</sup> Dynamic fluorescence Stokes's shift registered by C153 and C343 report bimodal relaxation processes in these media. The inter and intra relationship between rotation and solvation process associated with solvation and rotation of the hydrophobic C153 differ from hydrophilic C343 which reflects their qualitatively different local environments scene these two probes due to their chemical nature.

## REFERENCES

- [1] S. E. Debolt, P. A. Kollman, *J. Am. Chem. Soc.* **1995**, 117(19) 5316-5340.
- [2] S. A. Best, K. M. Merz, C. H. Reynolds, *J. Phys. Chem., B*, **1999**, 103(4), 714-726 (1999).
- [3] J. L. MacCallum, D. P. Tieleman, *J. Am. Chem. Soc.*, **2002**, 124(50), 15085-15093.
- [4] M. L. Horng, J. A. Gardecki, M. Maroncelli, *J. Phys. Chem. A* **1997**, 101 (6), 1030-1047.
- [5] S. Koley, H. Kaur and S. Ghosh, *Phys. Chem. Chem. Phys.*, **2014**, 16, 22352.
- [6] M. Kondo, X. Li, M. Maroncelli, *J. Phys. Chem. B*, **2013**, 117, 12224-12233.
- [7] Z. Hu, C. J. Margulis, *PNAS*, **2006**, 103(4) 831-836.
- [8] P. K. Mandal, M. sarkar, A. Samanta, *J. Phys. Chem., B* **2004**, 108(42), 9048-9053.
- [9] M. D. Ediger, *Annu. Rev. Phys. Chem.* **2000**, 51, 99-128.
- [10] B. Guchhait, S. Daschakraborty, R. Biswas, *J. Chem. Phys.*, **2012**, 136, 174503(1-16).