SUPPORTING INFORMATION

Concentration Dependent Anomalous Diffusion of Crystal Violet Dye in Agar Gel: Application of Continuous Time Random Walk Model

*Rachana D. Bamb[1], Prasad C. Walimbe[2], Sunil D. Kulkarni[*2], Preeti S. Kulkarni[*1]*

[1]Post Graduate and Research Center, Department of Chemistry, MES Abasaheb Garware College, Karve Road, Pune 411 004, India

[2]Post Graduate and Research Center, Department of Chemistry, S. P. Mandali's, Sir Parashurambhau College, Tilak Road, Maharashtra, Pune 411 030, India

***Corresponding authors:**

1] Sunil D. Kulkarni

Phone: (O): +91 20 24331978, Fax: +91 20 24332479

Email address: sunil.kulkarni@spcollegepune.ac.in

2] Preeti S. Kulkarni

Phone: (O): +91 *20 41038200,*

Email: psk.agc@mespune.in

Fickian diffusion and corresponding equations:

SIE-1	$J = -D\frac{\partial C}{\partial x}$	Fick's 1st Law
SIE-2	$\frac{\partial C}{\partial t} = D\frac{\partial^2 C}{\partial x^2}$	Fick's 2nd Law
SIE-3	$C(x,t) = \frac{lC_0}{2\sqrt{\pi Dt}}\ exp\{\frac{x^2}{4Dt}\}$	For smaller concentrations
SIE-4	$C(x,t) = C_0\{1 - erf\frac{x}{2\sqrt{Dt}}\}$	For larger concentrations

Figure S1: A Gaussian concentration profile of CV dye in agar gel for smaller and larger tracer concentrations.

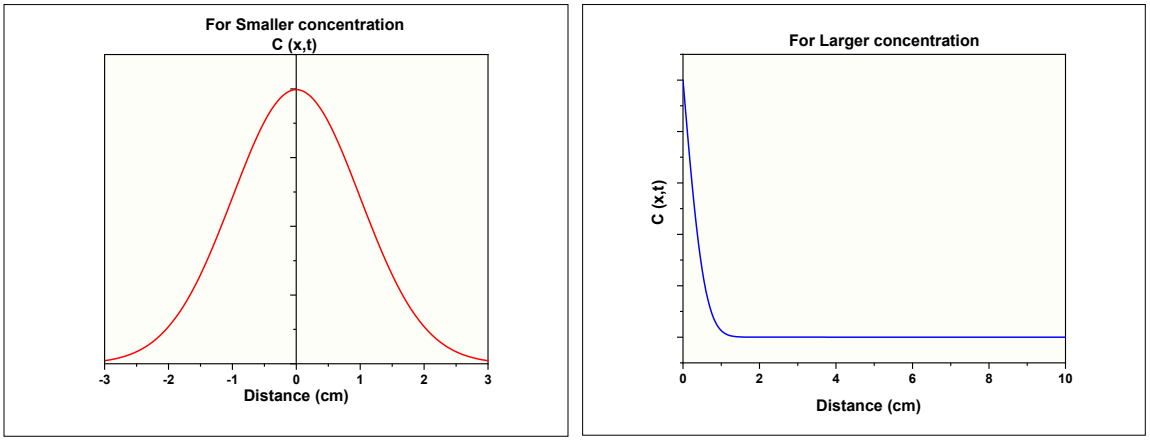
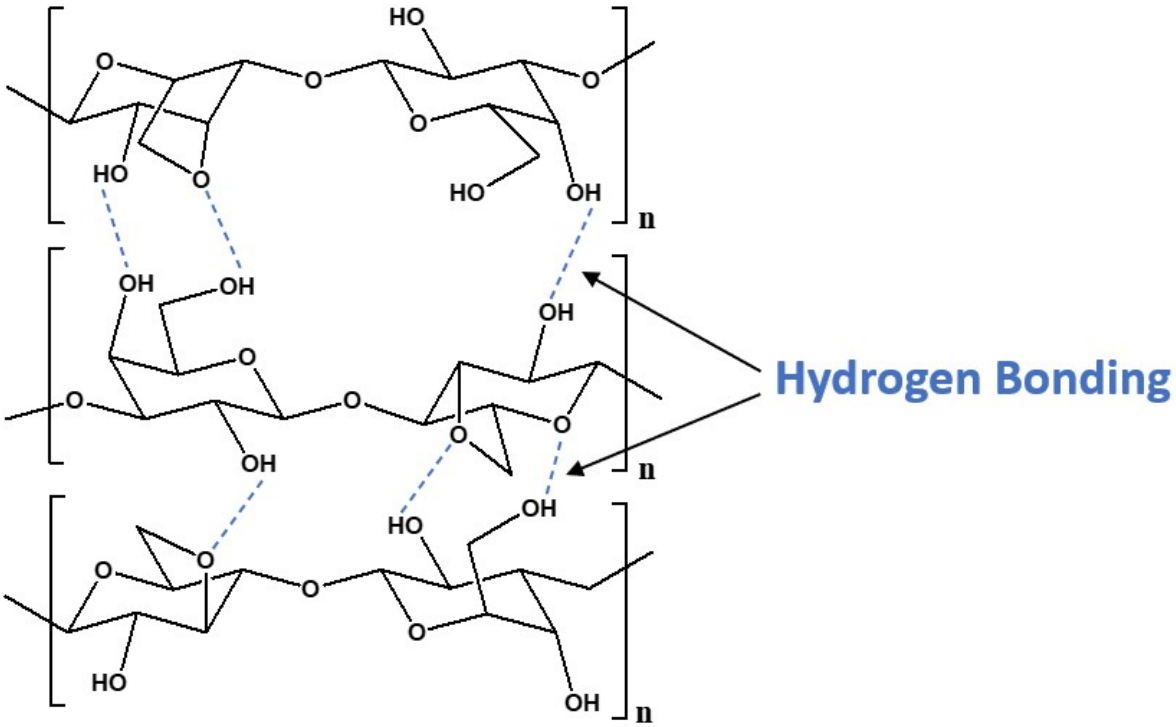
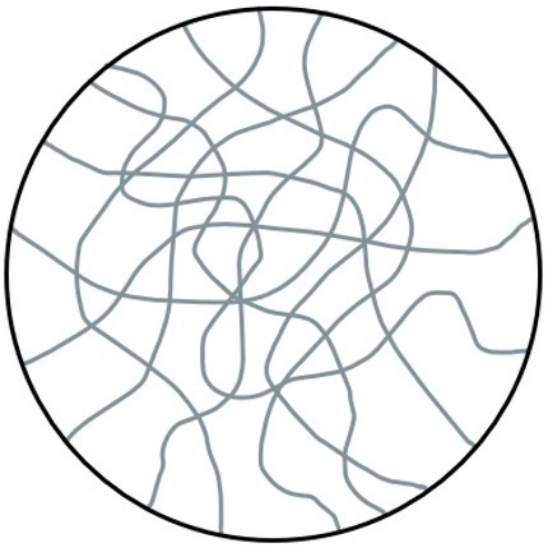
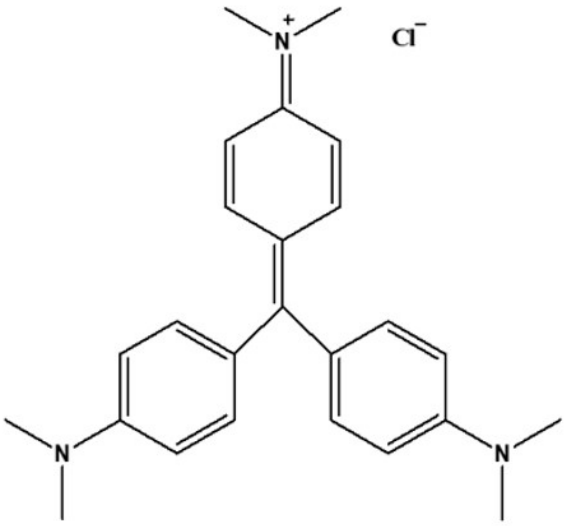


Figure S2: Structures of CV and agar gel polymeric chains.



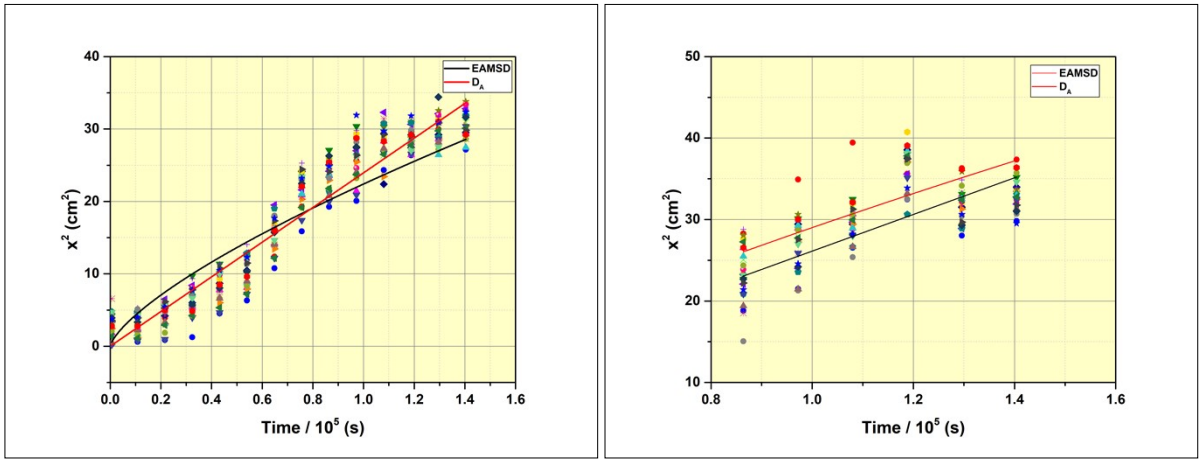


Agar Gel Polymeric Chains

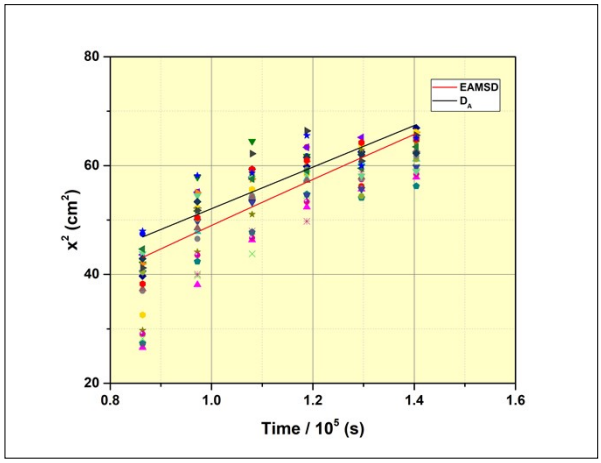


Crystal Violet Dye

Figure S3: The EA-MSD curves for (a) 400, (b) 600, and (c) 800 mg L^{-1} in 1% agar gel.

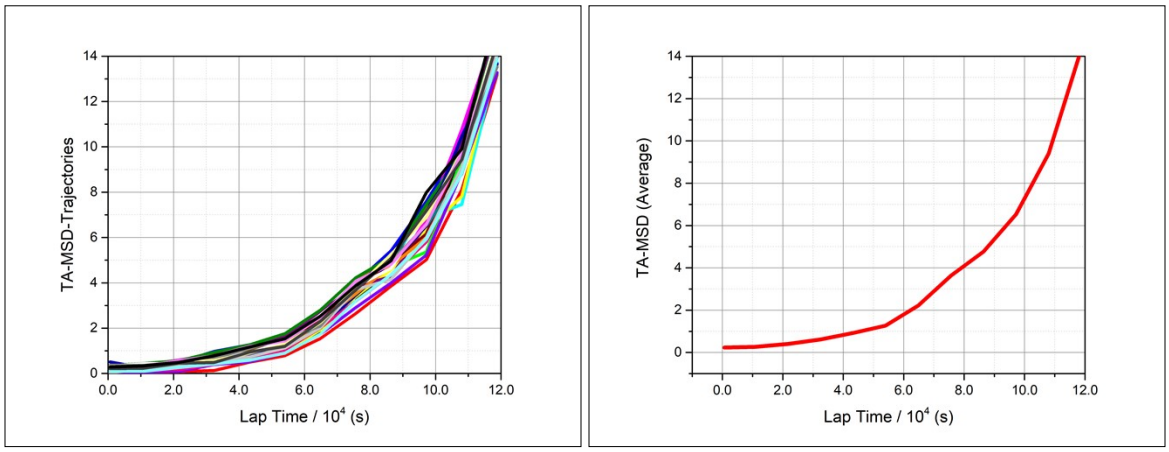


(a) **(b)**



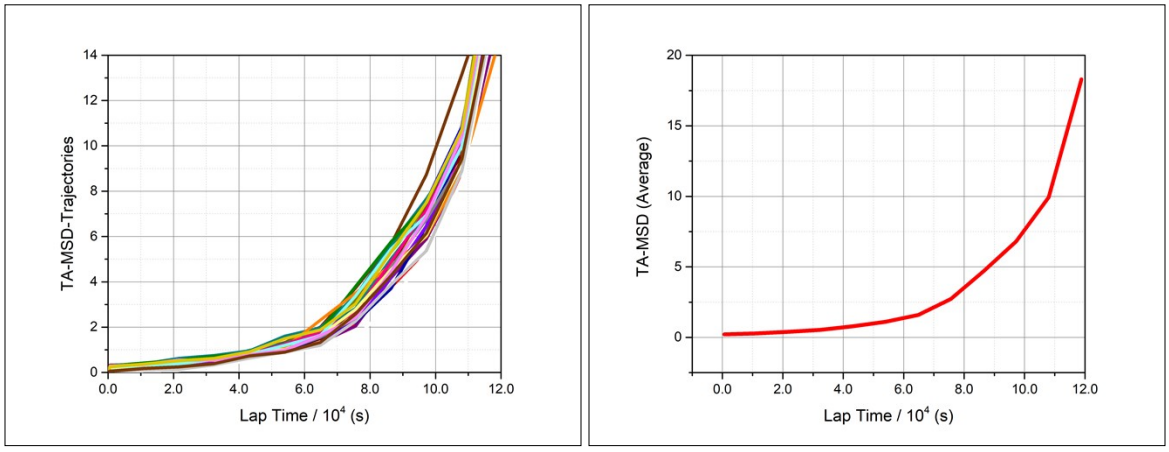
(c)

Figure S4: Variation of time-averaged mean square displacement with lap time for (a) twenty-five trajectories and (b) average trajectory (N=25) [$TAMSD_{AV} = \langle \delta^2(T_L) \rangle / N$] of the diffusion system comprising of [CV] = 400 ppm and % agar = 1.0.



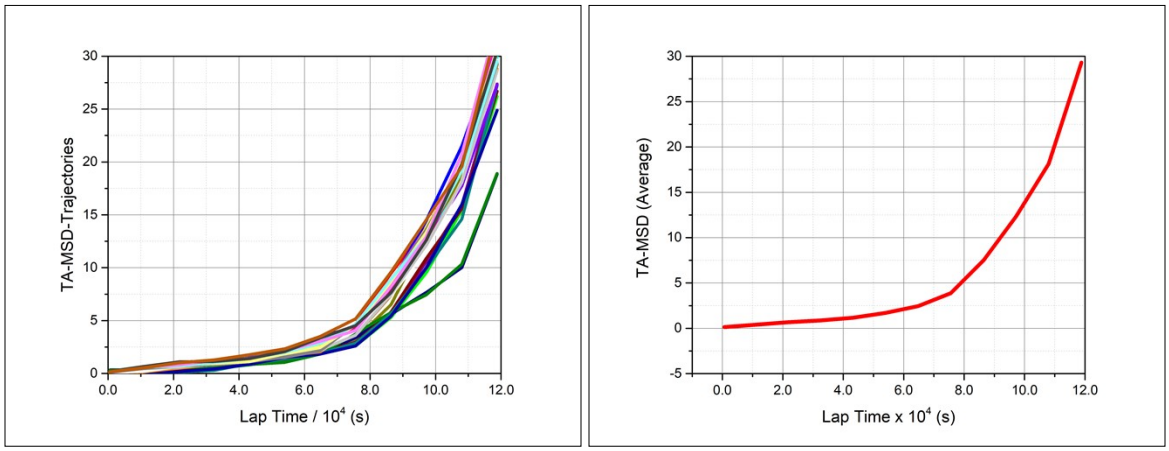
(a) **(b)**

Figure S5: Variation of time-averaged mean square displacement with lap time for (a)twenty-five trajectories and (b) average trajectory (N=25) [$TAMSD_{AV} = \langle \delta^2(T_L) \rangle / N$] of the diffusion system comprising of [CV] = 600 ppm and % agar = 1.0.



(a) (b)

Figure S6: Variation of time-averaged mean square displacement with lap time for (a)twenty-five trajectories and (b) average trajectory (N=25) [$TAMSD_{AV} = \langle \delta^2(T_L) \rangle / N$] of the diffusion system comprising of [CV]=800 ppm and % agar=1.0.



(a) **(b)**

Figure S7: (a) Statistical roughness of the entire diffusion path for a representative system. The rapid changes in the roughness upto 200 pixels are due to the movement of the dye solution in the reservoir. The smoothness in the middle region indicates the uniform spread of the dye (indirectly indicative of the dark blue region), whereas the roughness beyond 280 pixels indicates the trapping of dye molecules in the gel voids and a slow diffusion rate. (b) Texture and waviness also confirm the above observation.