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Supporting information for article:

On some aspects of crystallization process energetics, logistic new-phase nucleation kinetics, crystal size distribution, Ostwald ripening

Christo N. Nanev

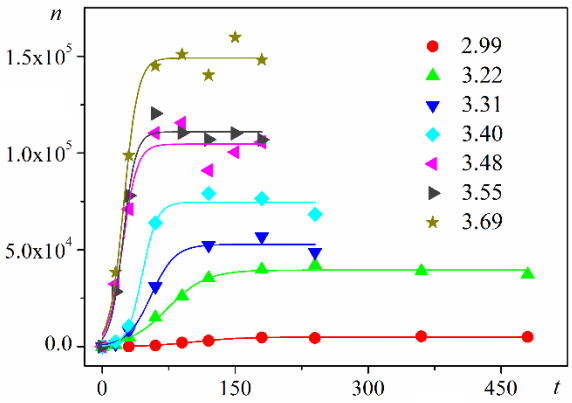
SUPPORTING INFORMATION

I. Original experimental data fitted to logistic dependence:

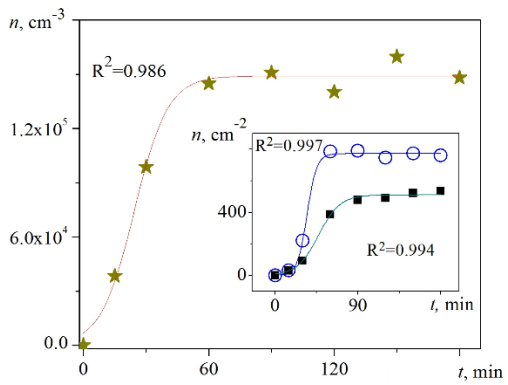
$$n = \frac{n_s}{1+\exp\left[-k\left(t-t_c\right)\right]}$$

where n [cm^{-3}] is nuclei number density, n_s is saturated nuclei number density, k [s^{-1}] is adjusting coefficient, t is time, and t_c being the point when $n = n_s/2$.

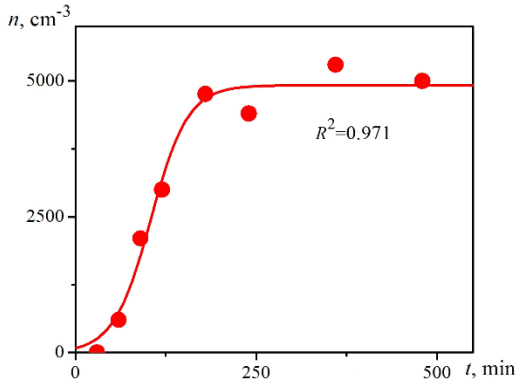
A. Insulin crystal nucleation (insulin from BioChemika, ≥ 85% (GE), ~24 IU/mg).



1. Plots of experimental n [cm^{-3}] vs. t [min] data for insulin crystal nucleation in bulk solution under series of supersaturations. Color symbols denote dimensionless supersaturations, $\ln(c/c_e)$, where c is the actual insulin concentration, c_e is the equilibrium one (Nanev, C. N. et al., 2011).

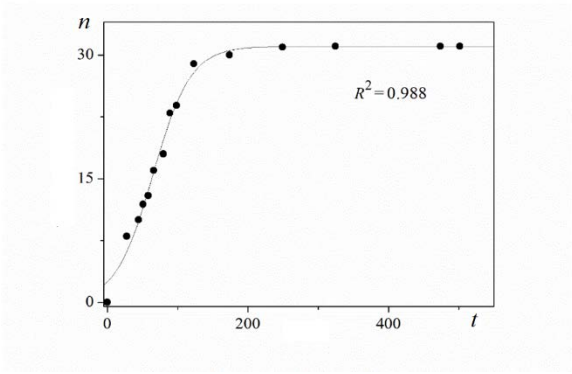
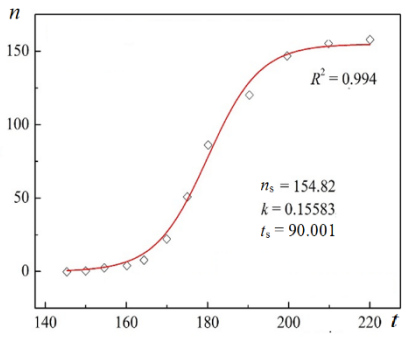


2. Plots of n vs. t, measured for insulin crystal nucleation at supersaturation 3.69: stars represent data for nucleation in bulk solution; the inserted graph shows nucleation on glass surface (open circles) and nucleation on the air/solution interface, black squares (Nanev, C. N. & Tonchev, V. D., 2015; Fig. 4).

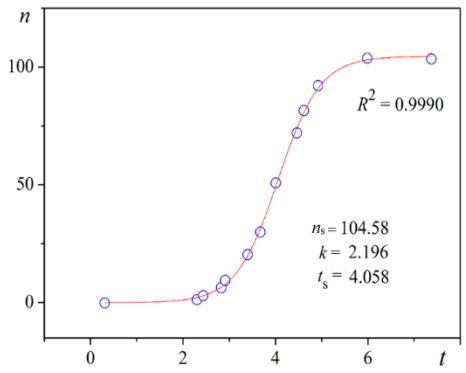
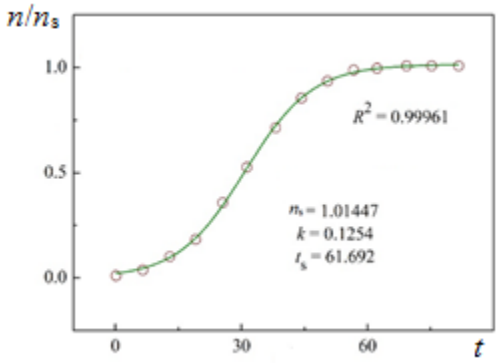


3. Plot of n vs. t data for insulin crystal nucleation in bulk solution at dimensionless supersaturation 2.99 (Nanev, C. N. & Tonchev, V. D., 2015; Fig. 3a).

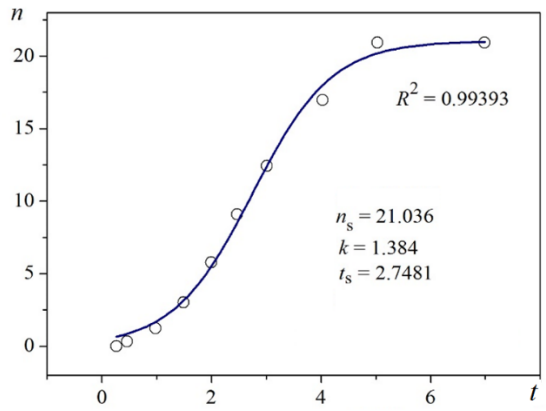
B. Crystal nucleation of other proteins

	
4. Two-stage nucleation mechanism of β-lactoglobulin crystals; n [cm^{-3}] vs. t [min], (Sauter, A. et al., 2015; Fig. 4).	5. Lysozyme crystal nucleation on nanoporous gold; n [cm^{-3}] vs. t [min] (Kertis, F. et al., 2012; Fig. 4(A)).

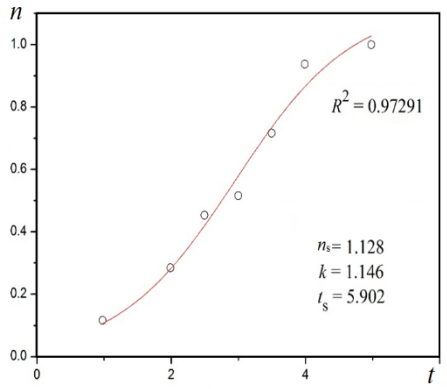
C. Crystal nucleation in other systems

	
6. Gold particles obtained from reduction of $HAuCl_4$; n [cm^{-3}] vs. t [sec] (Finney, E.E. & Finke, R. G. 2008; Fig. 3).	7. μ-cordierite crystals on a polished surface of cordierite glass; n/n_s vs. t [h] (Fokin, V. M. et al., 1997; Filipovich, V. N. et al., 1996; Fig. 3).

D. Electrochemical new-phase nucleation



8. Mercury droplets, n [cm^{-2}] vs. t [msec] (Toschev, S. & Gutzow, I., 1972; Fig. 8, 84 mV).



9. Silver crystals, n [cm^{-2}] vs. t [msec] (Milchev, A., 1998; Fig. 32, 175 mV).

Conclusion: Four nucleation kinetic time-scales are observed. The fastest is the electrochemical new-phase nucleation, [msec]. Crystal nucleation resulting from chemical reaction is a little bit slower, [sec]; the protein crystal nucleation proceeds on time-scale of minutes, while the most slower is the glass crystal nucleation, [h].

Literature

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