Erratum: Analytical approach to time lag in binary nucleation [Phys. Rev. E 59, 5124 (1999)]

P. Demo, Z. Kožíšek, and R. Šášik

[S1063-651X(99)15910-5]

PACS number(s): 64.60.Qb, 99.10.+g

In this paper we published an analytical formula [designated as Eq. (12)], estimating the time required to establish steady state in a nucleating binary system. To test our expression we compared the resulting time lags for a range of activities of both components with purely numerical simulations, and also with two other available analytical formulas by Wilemski [1] and by Shi and Seinfeld [2].

Unfortunately, during the preparation of Figs. 2 and 3 an error occurred: we forgot to divide the appropriate cluster sizes n_i $(i=A,B)$ in the Wilemski expression [designated as Eq. (1) in our paper] for the effective critical supersaturation S_C by the critical cluster size n_C. (In other words, we used the cluster size n_i instead of the mole fraction of the ith component x_i.) This omission resulted in the shift of the curves denoted as 3 in Figs. 2 and 3—and obtained from Wilemski's formula—to the higher values. In fact, the true dependencies are—based on the correct Wilemski expression—as represented in the corrected Figs. 2 and 3 here.

Consequently, it has to be pointed out that the results obtained by means of Wilemski's formula are in much better agreement with the purely numerical computation, and also with our analytical expression [denoted as Eq. (12)]. Further conclusions following from our paper remain unchanged (including the accuracy of our formula for time lag).

We acknowledge Gerry Wilemski who has indicated the possible mistake in the application of his relationship. This work was supported by Grant No. A2010926 of the Grant Agency of the Academy of Sciences of the Czech Republic.

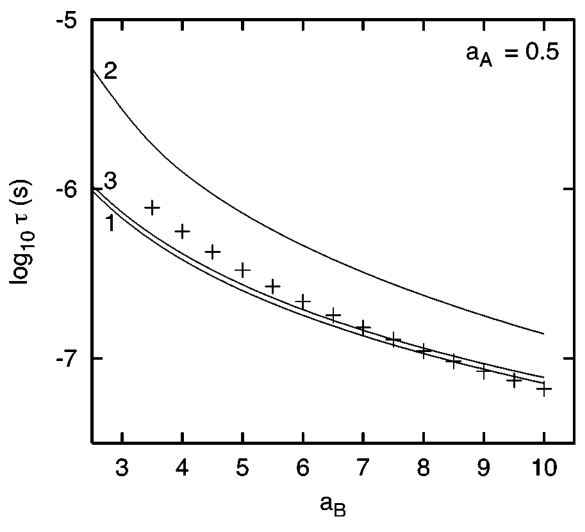

FIG. 2. Decimal logarithm of the time lag τ_D as a function of the activity a_B for $a_A=0.5$. Crosses, numerical calculation; 1, our analytical formula (12); 2, result of Shi and Seinfeld [expression (2)]; 3, time lag after Wilemski [relationship (1)]. Input parameters: $T=260$ K, $\sigma=2.5\times10^{-2}$ Jm^{-2}, $\gamma=1.1\times10^{-18}$ m^2, $P_A=400$ Pa, $P_B=150$ Pa, $m_A=6.6\times10^{-26}$ kg, and $m_B=9.9\times10^{-26}$ kg.

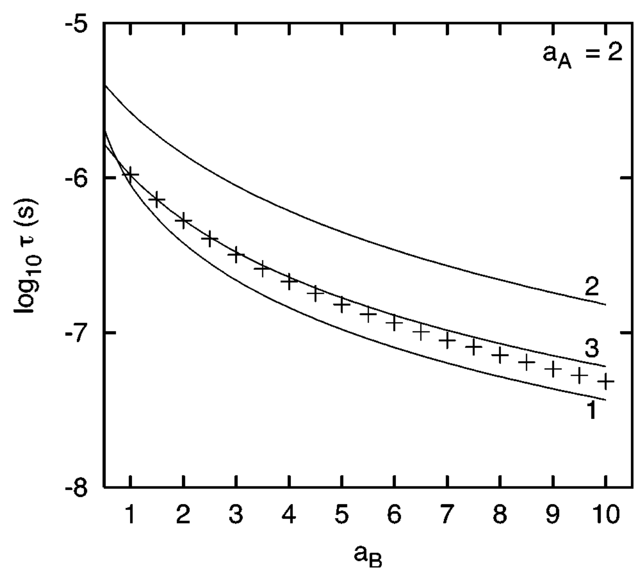

FIG. 3. Decimal logarithm of the time lag τ_D as a function of the activity a_B for $a_A=2$. Crosses, numerical calculation; 1, our analytical formula (12); 2, result of Shi and Seinfeld [expression (2)]; 3, time lag after Wilemski [relationship (1)]. Input parameters: $T=260$ K, $\sigma=2.5\times10^{-2}$ Jm^{-2}, $\gamma=1.1\times10^{-18}$ m^2, $P_A=400$ Pa, $P_B=150$ Pa, $m_A=6.6\times10^{-26}$ kg, and $m_B=9.9\times10^{-26}$ kg.

[1] G. Wilemski, J. Chem. Phys. **62**, 3772 (1975).
[2] G. Shi and J. H. Seinfeld, J. Chem. Phys. **93**, 9033 (1990).