To the Editor:

The purpose of this letter is to address some conclusions drawn in the article entitled "Population balance model for nucleation, growth, aggregation and breakage of hydrate particles in turbulent flow" by Balakin et al.[1] Four modification coefficients are used in this article, k_1, k_2, k_3, and k_4 for their models. These four coefficients are used for the nucleation, growth, aggregation and breakage terms, respectively. Among the units of these four coefficients, two of them are unusual and rather meaningless units, that the unit for k_3 is $J^{0.18}$, and the unit for k_4 is s^{b-1}/m^3. It is obvious that these are the results of dimensional analysis. The coefficient k_3 appears in Eq. 14, and this equation is based on van de Ven and Mason's work.[2] The coefficient k_4 appears in Eq. 16, and this equation was original raised up by Spicer and Pratsinis.[3]

Van de Ven and Mason[2] suggested an expression of collision efficiency α that $\alpha = k[H/(36\pi\mu\gamma\bar{r}^3)]^b$, and emphasized $H/(36\pi\mu\gamma\bar{r}^3)$ is a dimensionless number. Here, H is the Hamaker constant and the value is unavailable in literature. While in Balakin et al.'s article,[1] the $k_3 = k \cdot H^b$ coefficient. It is clear that $k_3 = 36\pi\mu\gamma\bar{r}^3\alpha$. From the context, the shear rate γ, and the mean radius $\bar{r}$ are known and viscosity is not listed. Why the authors expanded the dimensionless number and created a new coefficient with such nonphysical meaning unit J^b ($b = 0.189$ and 0.19)?

Second, the power shown in Eq. 16 is a semiempirical number from the experimental data of particles with radius 0.5, 1 and 2 μm.[2] While in Balakin et al.'s article,[1] the size of particle is much larger, that r covers the range from 0 to 400 μm. Some references,[4,5] suggested that when the size of particle is larger than 100–250 μm, the van der Waals force can be neglected and the momentum transfer plays the main role in such flow. Hence, the power law shown in Eq. 16 cannot be used for such big particles. Same as what they did, the dimensionless number $H/(36\pi\mu\gamma\bar{r}^3)$ (or k_3 in the article), and the exponential coefficient b could be obtained from the experimental results when the particles are not so huge. However, the number of experimental data is too few for such data fitting. There are only two groups of experimental result for the mean particle diameter d, less than 100 μm in the experimental data shown in Figures 3, 4 and 6. Each of the group involves a point showing the mean dia. $d = 0$ μm at time $t = 0$ s. Definitely, these points should be there because they are artificial initial condition, somehow.

Third, for the breakage term, Barthelmes et al.[6] induced a new expression of breakage function from Spicer and Pratsinis's work.[3] Thus, the coefficient k_4 are nondimensionalized that $g = k_4\left(\frac{G}{k_b}\right)^b \bar{r}$, in which k_b = 1/s is used to match the dimension of the shear rate. Perhaps this expression can make the coefficient with a fixed unit and more physical meaning, but the values are kept as the same as those listed in the article.

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AiChE Journal, Vol. 57, 2287 (2011)

DOI 10.1002/aic/12676
Published online June 1, 2011 in Wiley Online Library (wileyonlinelibrary.com).