LETTERS TO THE EDITOR

NOTE ON "DETERMINATION OF PHASE CONTACT SURFACE IN BUBBLING SYSTEMS" (IFZh, No. 6, 1964)

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In the paper cited we derived a formula for calculating the specific surface area of gas bubbles assuming normal size distribution.

It may be shown that in the general case, for an arbitrary distribution given by a function $f(x)$

$$\int f(x)\,dx = 1,$$

we may write

$$\sigma^2 = \int (x - d_m)^2\,dx = \frac{F}{\pi} - d_m^2,$$

$$\mu_3 = \int (x - d_m)^3\,dx = \frac{6}{\pi} V - d_m^3 - 3d_m\sigma^2,$$

whence

$$F = \pi\,(d_m^2 + \sigma^2),$$

$$V = \frac{\pi}{6}\,(d_m^2 + 3d_m\sigma^2 + \mu_3),$$

$$f = \frac{F}{V} = \frac{6}{d_m}\;\frac{d_m^2 + \sigma^2}{d_m^2 + 3\sigma^2 + \mu_3/d_m}.$$

Thus, the formula presented previously is a special case and is valid not only for a normal distribution law, but for any symmetrical size distribution ($\mu_3 = 0$).

The distribution of bubble size in a bubbling layer is asymmetric, but $\mu_3 < d_m$ (the value of d_m oscillates from 2 to 5 mm, while $\mu_3 < 1$), and, in addition, the accuracy of calculation of the moment of third order for an inconsiderable sample size is extremely small. It is therefore expedient to exclude from the formula the additional term μ_3/d_m, which takes account of asymmetry of size distribution, this leading to some reduction in the accuracy of the results.

Thus, the formula for calculating the specific surface area of the bubbles during bubbling

$$f = \frac{6}{d_m}\;\frac{d_m^2 + \sigma^2}{3\sigma^2 + d_m^2}$$

may be used independently of the bubble size distribution law.

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