Comment on "Scaling behavior in explosive fragmentation"

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We discuss the data analysis and the conclusions based upon the analysis given in the paper by Diehl *et al.* [Phys. Rev. E **62**, 4742 (2000)].

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In Eq. (2) of Ref. [1] the cumulative fragment size distribution is defined as

$$F(m)=\frac{1}{m}\int_{m}^{\infty}n(m')dm', \tag{1}$$

where m takes values between 1 and ∞. This quantity has the benefit that it provides numerical data which are typically much smoother than those for the spectral distribution $n(m)$. In particular since fragment-size distributions are usually of a power-law form, i.e., the "normalized" spectral distribution is $\alpha m^{-(1+\alpha)}$ for a wide range of fragment sizes m, followed by a more or less exponential cutoff at large m. Then $F(m) \approx m^{-(1+\alpha)}$ initially, with a similar exponential cutoff. In order to use Eq. (1) for analyzing numerical data, it is however necessary that α is clearly larger than zero. If α is close to zero, the probability of finding small fragments is also very small. Then $F(m)$ is, by definition Eq. (1), proportional to $1/m$. Notice that $F(m)\approx m^{-1}$ in the limit of small m for *any* *n(m)* that goes to zero when $m\to 0$. This becomes very clear in Ref. [1] when the analysis is applied to the log-normal distribution. It is evident from Fig. 5 of Ref. [1] that the cumulative log-normal distribution defined by Eq. (1) decays like $1/m$ for small m, but there is no such power law in the spectral log-normal distribution as it goes to zero in the limit of small m. In contrast with the analysis reported in Ref. [1], it is not correct to conclude that the *spectral* fragment-size distribution shows a scaling behavior for small m with an exponent close to -1. The authors of Ref. [1] should plot $n(m)$ instead of $F(m)$ in their Figs. 4 and 5, in order to analyze the scaling properties of $n(m)$. When doing molecular-dynamics simulations for Lennard-Jones systems, very long simulation times are needed for the equilibria configurations [2]. This problem makes the scaling analysis fairly tedious in these systems.

[1] A. Diehl, H.A. Carmona, L.E. Araripe, J.S. Andrade, Jr., and G.A. Farias, Phys. Rev. E **62**, 4742 (2000).
[2] J.A. Åström, B.L. Holian, and J. Timonen, Phys. Rev. Lett. **84**, 3061 (2000).

