$$I_{abs}k^8 = \frac{2\varrho_0^2\pi^4}{C^2}\int_0^\infty \frac{N(R_g)}{R_g^2}\,dR_g\,.$$

Taking for $N(R_g)$ the function (24), we obtain the relation between the constant value $I_{abs}k^8$ and the parameters describing the system:

$$I_{abs}k^8 = \frac{2\varrho_0^2\pi^4}{C^2}\frac{(n+1)^2}{n(n-1)}\frac{1}{\langle R_g\rangle^2} \text{ for } n>1\,. \quad (32)$$

If the assumed distribution law were correct and if the experimental scattering curve could be fitted to one of the calculated scattering curves, it would be possible to determine the values of $\langle R_g\rangle$ and n. In this case ϱ_0 could be determined from equation (32) and the relative density of the whole particle with respect to the matrix would be known.

As the k^{-8} dependence of intensity at high angles is characteristic for Cos–EDD particles independently of the statistical features of the system, it may be used as a criterion of whether such particles are present. However, with the common small-angle cameras we can measure the scattering up to about $k=0{\cdot}6$ (or $\varepsilon\simeq 8°$ for Cu $K\alpha$ radiation). In order to verify the k^{-8} law we must reach experimentally $k\langle R_g\rangle$ greater than about 18 and therefore the mean $\langle R_g\rangle$ of the system should exceed 30 Å. At high angles the scattered intensity would be a few orders of magnitude weaker than the scattering of the statistically analogous system of homogeneous spheres.

For systems of smaller particles the scattering curve in the k^{-8} region cannot be measured, and only a comparison with the calculated scattering curves will make it possible to determine whether the particles correspond to the Cos–EDD model. And this, as often emphasized, is a procedure which does not lead to conclusive answers, because completely different systems can give nearly identical scattering curves. Even if we knew that all the particles were spherical and had the same electron density distribution, it would be difficult – purely on the basis of scattering curves – to determine unambiguously the model for the particles and the statistical parameters.

The shapes of many actual distributions of particle sizes of various substances measured by means of electron microscopy are symmetric or fall more steeply on the side of the larger particles. In such cases the application of not only the M–P distribution but also the Maxwellian and Gaussian distributions to describe the number and not the mass statistics of the system appears more justified.

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Spinodal Decomposition in Al-Base Alloys Quenched from the Liquid State – A Small-Angle X-ray Scattering Study

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Small-angle X-ray scattering has been used to study early-stage spinodal decomposition in Al-base Zn and Al-base Ag alloys which were liquid-quenched at rates of the order of 10^6 °C/sec. Such ultra-rapid cooling yields a well-quenched specimen having a narrow solute cluster-size distribution, which persists at ambient temperature. Al–Zn alloys, up to 22 at.% Zn, have been studied and show clear linear spinodal behaviour for aging at temperatures below 100°C. The situation is less certain for Al–Ag, but liquid quenching does clarify the early-stage phase decomposition behaviour. In alloys in the range of 15 at.% Ag, spinodal decomposition is observed to be the initial mode of phase decomposition.