Compositional Distributions in Multicomponent Aggregation

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We consider the problem of binary aggregation with kernels that are independent of composition. We write the bivariate distribution as the product of two distributions, one that refers to the size of the aggregates and one that describes the distribution of the component of interest (solute) and obtain the governing equation for all three. The distribution of solute within aggregates of size v has a steady-state solution that is independent of the size distribution: it is a gaussian function whose mean and variance are both proportional to the aggregate size v. To quantify the degree of blending we study the sum-square, X^2, of the deviation of the amount solute from its mean. We identify two cases for which X^2 is constant during aggregation. These cases are: (a) partially mixed seeds regardless of kernel; and (b) sum-type kernels regardless of seed distribution. Simulations confirm the results for these two cases and further indicate that in the general case, X^2 is nearly zero. We conclude that degree of mixing is determined by the initial distribution of components but does not depend on the kernel.