Coagulation equations: a few theoretical and numerical approaches.

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Abstract

Over the past few decades, increasing attention has been given to the mathematical theory of coagulation equations. This is due to the shift in industry's interest towards optimizing various processes that work with large numbers of small-sized particles undergoing coalescence. Coagulation plays an important role in the dynamics of particle size and mass distributions. In this talk I will present two types of coagulation processes under the presence of particle source terms. First, I consider the case of a weak coagulation for which I proposed a new reliable numerical method (adaptive power series method) when compared with the existing methods in the literature. Secondly, a few theoretical and numerical results will be presented for a class of coagulation kernels that are increasing sufficiently fast with their sizes. One interesting property of some coagulation equations is that they need not always conserve mass (phenomenon known as "gelation"). We will show that the occurrence of gelation is related, in some cases, to the occurrence of a shock in certain hyperbolic PDEs.