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Moments estimates for the discrete coagulation-fragmentation equations with diffusion

Coagulation-fragmentation equations can be used to study a wide range of phenomena, ranging from blood coagulation and polymer formation to galaxy formation. The (discrete) model consist in an infinite system of reaction diffusion equations, each equation describing the evolution of the concentration of clusters of a given size/mass. While the spatially homogeneous case has been studied extensively, there are fewer mathematical results available when spatial inhomogeneity is taken into account.

In this talk I will explain how the so called duality lemma can be used in this context, to get estimates on the moments of the solution, leading to regularity results. This is joint work with L. Desvillettes and K. Fellner. I will also show how these estimates can be used to study the gelation issue, and prove that strong enough fragmentation can ensure mass conservation even for superlinear coagulation coefficients.