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Dynamics of length distributions of in vitro intermediate filaments

Intermediate filaments are one of the cytoskeleton components. The cytoskeleton is an intracellular structure made of structural proteins polymerized in filaments that are organized into networks in the cytoplasm. Here a general method is given to study the temporal evolution of length distributions of filaments described as linear macromolecules. An aggregation model with explicit expression of association rate constants depending on the properties of interacting objects is considered. The rate constants are derived using Smoluchowski's theory. A set of hypotheses on the geometry and properties of interacting macromolecules is considered, leading to a collection of models. Fitting of model responses to experimental data yields the best-fit for each model in the collection. By using model selection, the more appropriate model to represent the assembly at a given time point is identified. Hence, conclusions on the object properties can be drawn.