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# Non-equilibrium cluster-cluster aggregation in the presence of anchoring sites

Non-equilibrium cluster-cluster aggregation of scaffold proteins has been hypothesized to underly the formation and maintenance of inhibitory postsynaptic domains of neurons, where the desorption of scaffold proteins into the cytoplasm imposes a cut-off on possible aggregate sizes and gives rise to a stationary size distribution. Here, we investigate the case of non-equilibrium cluster-cluster aggregation in two dimensions where diffusing particles and/or clusters remain fixed in space at specific anchoring sites, which should be particularly relevant for synapses but may also be present in other biological or physical systems. Using an effective mean-field description of the concentration field around anchored clusters, we derive an expression for their average size as a function of parameters such as the anchoring site density. We furthermore propose and solve appropriate rate equations that allow us to predict the size distributions of both diffusing and fixed clusters. We confirm our results with particle-based simulations, and discuss potential implications for biological and physical systems.

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