# Self-limiting Assembly in Systems of Bipods via Geometrical Frustration

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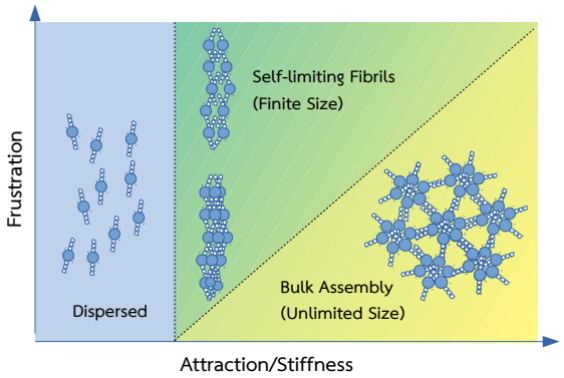
Self-limiting assembly arises when local interactions between building blocks are incompatible with forming uniform (bulk) materials, referred to as geometric frustration. Examples of assemblies with self-limiting includes protein filament bundles, twisted molecular crystals, chiral smectics and membranes [1,2]. It is challenging to use geometrical frustration as a design concept to create finite-size equilibrium assemblies in soft matter, despite major efforts to build a general theory on the subject.




In this study, we systematically control geometrical frustration in system of bipods to demonstrate self-limiting self-assembly. We deploy a minimal computational model consisting of a central sphere that connect to two attractive rigid rods diametrically via a flexible hinge. Regulating the flexibility (stiffness) of the hinge and rod attraction, formation of anisotropic fibrillar assemblies are observed. The lateral width of the fibrils can be controlled by the misfit introduced by the radius of the central sphere. Our model - the bipods - can be realized in experiments as nanoparticles with tethered polymer bundles, partially unfolded polymer globules and organic molecules.

[1] G. M. Grason, *Nat. Phys*, **2017,** *13*, 1149 -1150
[2] M. F. Hagan and G. M. Grason, *Rev. Mod. Phys.*, **2021,** *93*, 025008 1-48