Coherent Van der Waals Matter

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When polarisable objects are excited by a spatially randomly fluctuating medium and in turn interact, we speak of "Van der Waals – London" type dispersion forces. But what happens if the excitation is non-equilibrium and spatially coherent? We show that such a "**coherent Van der Waals**" interaction has remarkable and distinctive physical features making it a practical, potentially important tool for colloidal self assembly of complex hierarchical materials. Owing to these features, distinguishing it from its "incoherent sister" - the usual dispersion interaction- the coherent Van der Waals gives rise to complex hierarchically self assembled materials displaying local cohesion on small scales but an average repulsion on larger scales, inflating the material with a net positive pressure. We will illustrate the main steps in the hierarchical formation process of coherent colloid self assemblies, from elementary colloidal units driven by dominant 3-body forces, over the formation of chains, transition to membranes, to large scale foam likes structure of the material ("magnetic doughs") set by the inter- membrane interactions.

References:

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