

## Structures in a paramagnetic colloidal suspension subjected to a dc magnetic field

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A paramagnetic colloidal suspension is a mixture in which solid paramagnetic nano/micro particles are dispersed in a liquid. When paramagnetic particles are subjected to an external magnetic field, the magnetic dipole moment is induced in each paramagnetic particle and anisotropic magnetic dipole-dipole interactions are induced between paramagnetic particles. Therefore, various structures are formed by paramagnetic particles in the paramagnetic colloidal suspension [1, 2]. In this study, we investigate the structures formed by paramagnetic particles subjected to a dc magnetic field.

In this experiment, a paramagnetic colloidal suspension, which is enclosed in a test cell made of polydimethylsiloxane elastomer sandwiched by two glass substrates, is subjected to a dc magnetic field in a perpendicular direction to the layer of the colloidal suspension. The structures formed by paramagnetic particles are observed by an optical microscope and analysed with the parameters computed from the micrograph.

We find that when the layer of the suspension is shallow, individual straight chains and walls are formed, whereas as the depth of the layer increases, walls and thick columns are formed, in which case staggered chains are connected in the lateral direction.

### References:

[1] T. Ukai and T. Maekawa, *Phys. Rev. E*, **69**, 032501 (2004).

[2] T. Ukai, J. Dong, T. Maekawa and H. Morimoto, *AIP Advances* **10**, 055012 (2020).