ESRF	**Experiment title:** Shape-dependent assembly of superballs under spherical confinement and external fields	**Experiment number**: 26-02-918
Beamline: BM26B	**Date of experiment**: from: 05/06/2021 to: 10/06/2021	**Date of report**: 02/08/2021
Shifts: 12+3	**Local contact(s)**: Martin Rosenthal, Daniel Hermida Merino	*Received at ESRF:*

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Report:

The objective of this experiment was to determine the effect of shape, size, and inherent magnetism of core-shell hematite-silica colloidal superballs on their self-assembly under spherical confinement. The formed macroscopic spheres were prepared by drying droplets of superball dispersions on a superhydrophobic substrate both inside and outside of a magnetic field.

Examples of collected SAXS patterns over the drying time of a dispersion droplets dried in the absence of a magnetic field are shown in Figure 1. The obtained data shows that when there is no magnetic field present, we observe mainly isotropic scattering up until the apperance of low-order hexagonal peaks which suggests we form a mainly polycrystalline hexagonal lattice throughout the assembled macroscopic sphere.

When a magnetic field is applied during the drying process, we can see initially the presence of particle-particle alignment in the magnetic field as evident from the first anisotropic scattering profile in Figure 2. As the droplet continues to dry, the collodial superballs form

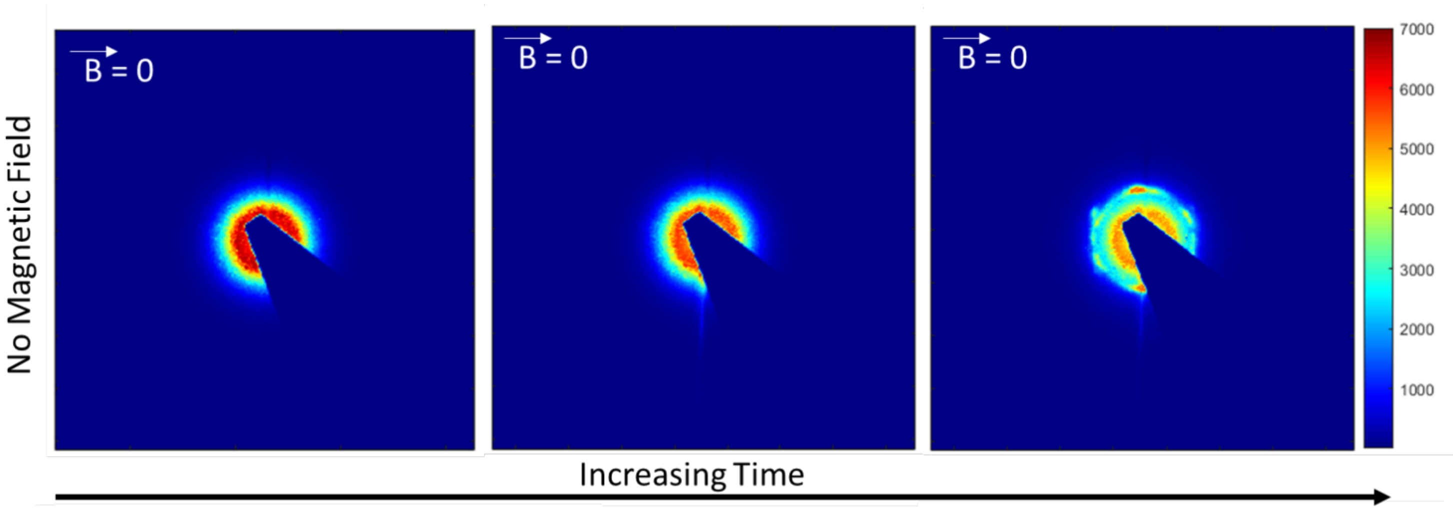

Figure 1 Examples of SAXS patterns of a drying dispersion droplet on a superhydropic substrate over time in the absense of a magnetic field. All images have already been background subtracted.

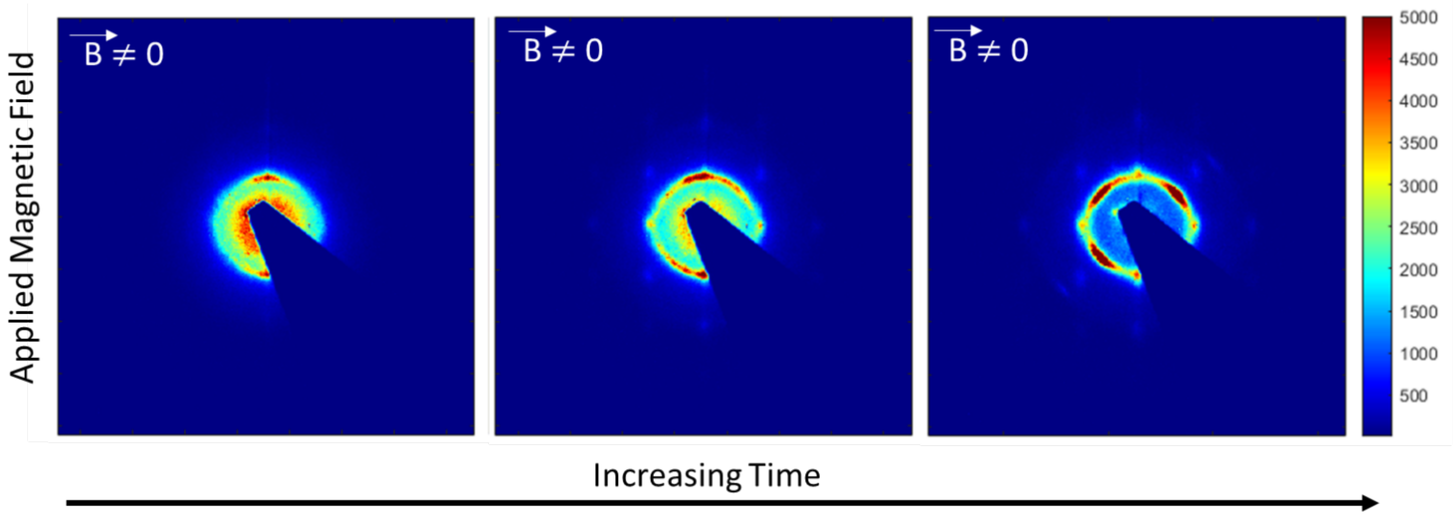

Figure 2 Examples SAXS patterns of a dispersion droplet drying in the presence of a magnetic field. Here, the background was subtracted.

crystalline rhombohedral lattices as shown from the presence of well-defined diffraction patterns. Near the end of drying in a magnetic field, cubic patterns are apparent along with the rhombohedral patterns.

By applying a magnetic field to a drying dispersion droplet of magnetic superballs, we can see a more defined lattice form compared to drying in the absence of a magnetic field. While the two figures here depict the same sample, we also tested several different superball shapes and shell thicknesses to compare how the structure changes based on the particle shape.

We would like to thank the DUBBLE team and, in particular, Martin Rosenthal and Daniel Hermida Merino for support throughout the experiment and for giving the possibility of using an additional 3 shifts at the end of the experiment.