Supporting information

Structure and Stacking Order in Crystals of Asymmetric dumbbell-like Colloids

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1 Movement of diffraction peaks as a function of ω

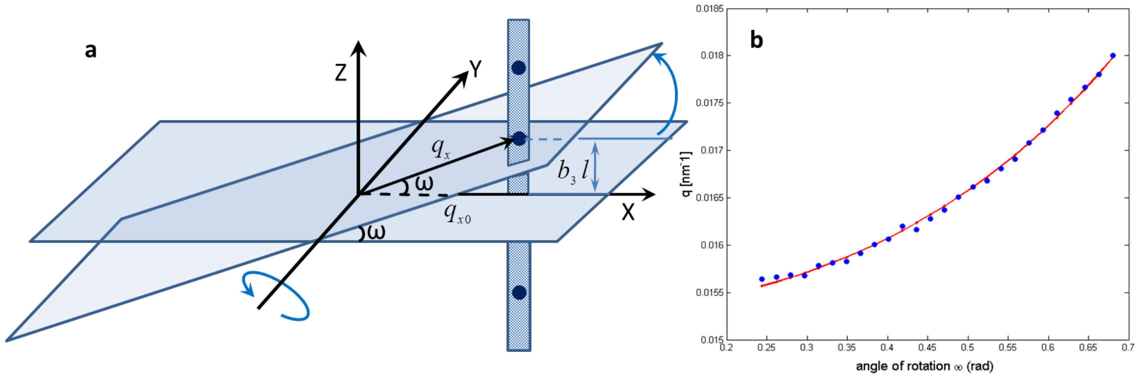

Figure S1: (a) Schematic of rotational scheme of the capillary about Y or $y\prime$ axis which is also the vertical direction of the capillary. (b) variation of the scattering vector q as a function of rotational angle ω.

As ω changes from zero, the q-value for the diffraction peak with which the first order ring is composed of changes monotonically. As the capillary is rotated along laboratory $y\prime$ axis which is also the vertical axis of the capillary, one would expect to explore the Fourier space along crystallographic Z direction as shown in fig. S2. For any diffraction peak at an angle of rotation ω, $q_x = q_{x0}/cos(\omega)$ and $q_y = q_{y0}$, q_{x0} and q_{y0} being the components of the scattering vector q at $\omega = 0$, resulting,

$$\begin{aligned} q &= \sqrt{q_y^2 + q_x^2} \\ &= \sqrt{q_{y0}^2 + \frac{q_{x0}^2}{cos^2(\omega)}} \\ &= \sqrt{q_{y0}^2 + \frac{(b1^2 - q_{y0}^2)}{cos^2(\omega)}} \end{aligned} \qquad \text{(S1)}$$

b_1 being the magnitude of one of the lattice vectors in the hexagonal plane, so at $\omega = 0°, q_0 = b_1$. Eq. S1 explains the movement of any diffraction peak with the rotation of the capillary about Y axis. Fig. S2 shows the experimentally obtained q as a function of ω (blue dot) and a fit using the eq. S1 (red line). Since the eq. S1 has been calculated by considering a rod perpendicular to the capillary wall at normal incidence, the agreement of the experimental data with the theoretical expression proves that the observed elongated features in the reciprocal space are straight lines.

2 Conversion from ω to l

Any length in the Z direction can be expressed as $b_3 l$, b_3 being the lattice vector along Bragg rod direction (fig. S2). The intensity modulation along Bragg rod can be quantitatively expressed as the variation of intensity (I) as a function of l. However, experimentally I can only be measured as a function of ω. To express I as a function of l one has to convert the rotation angle ω to l by using the following expression (to visualize the situation look into fig. S2),

$$\begin{aligned} tan(\omega) &= \frac{b_3 l}{q_{x0}} \\ \Rightarrow l &= \frac{q_{x0}}{b_3} tan(\omega) \end{aligned} \quad \text{(S2)}$$

3 Visualization of Bragg cylinder

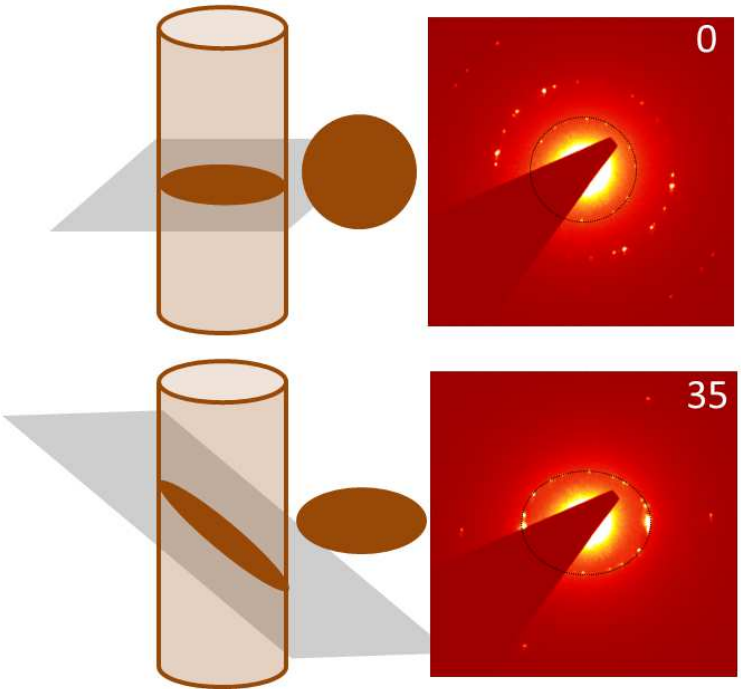

Figure S2: At $\omega = 0^\circ$, the intersection of the $(1\,0\,l)$ Bragg cylinder and Ewald sphere appears as a circle. This circle is visible in the diffraction pattern corresponding to $\omega = 0$. As the capillary is rotated about $y\prime$ axis, this intersection becomes elliptical as observed for the higher angles e.g. at $\omega = 35^\circ$. In case of very small angle diffraction, the Ewald sphere effectively looks like a plane which is shown by the gray plane in the above schematic and the intersections are shown by brown circle and ellipse respectively.