Supplementary information

Exploring the effects and mechanisms of carbon nanomaterials diversity on morphology of lysozyme crystals

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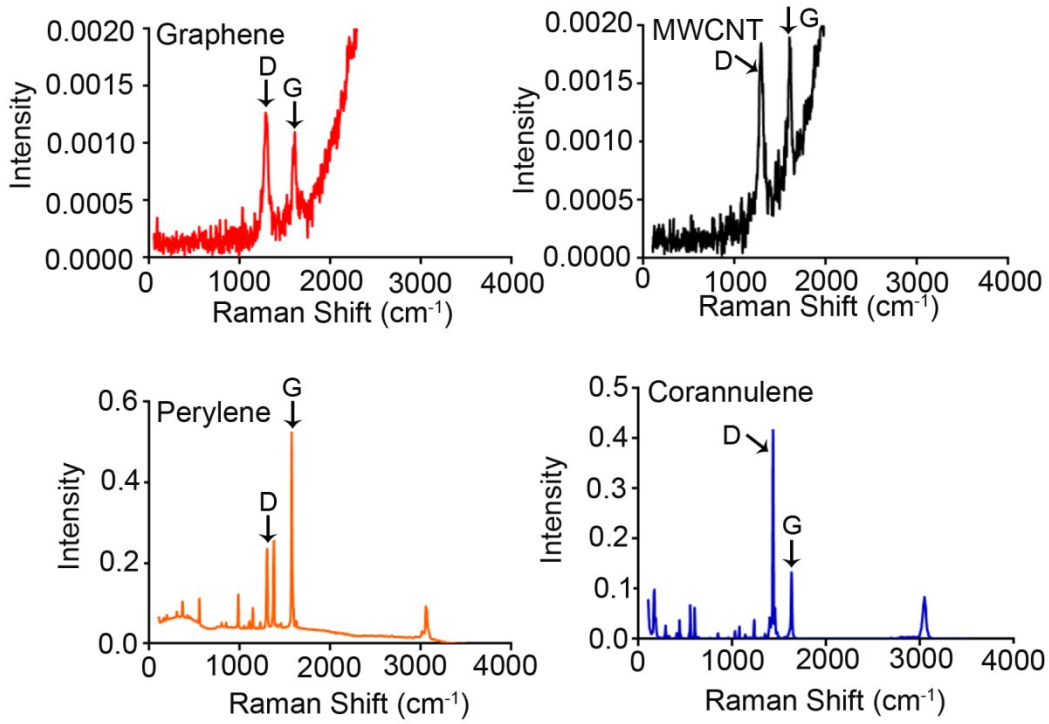
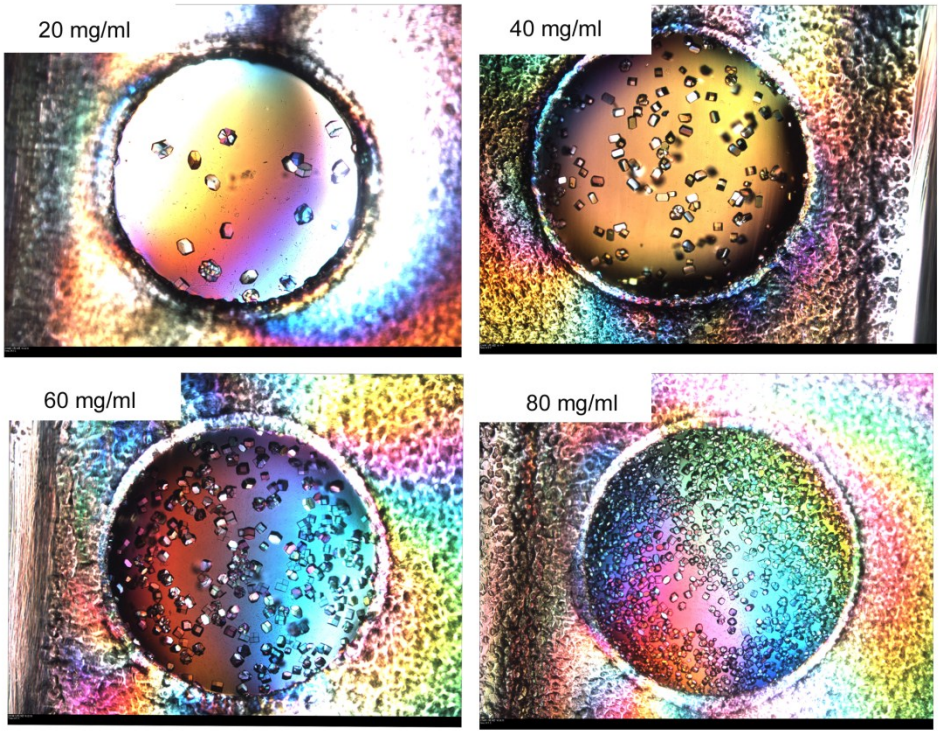
†. These authors have same contribution to this research.

Supplementary 1: FT-Raman spectra of carbon nanomaterials used



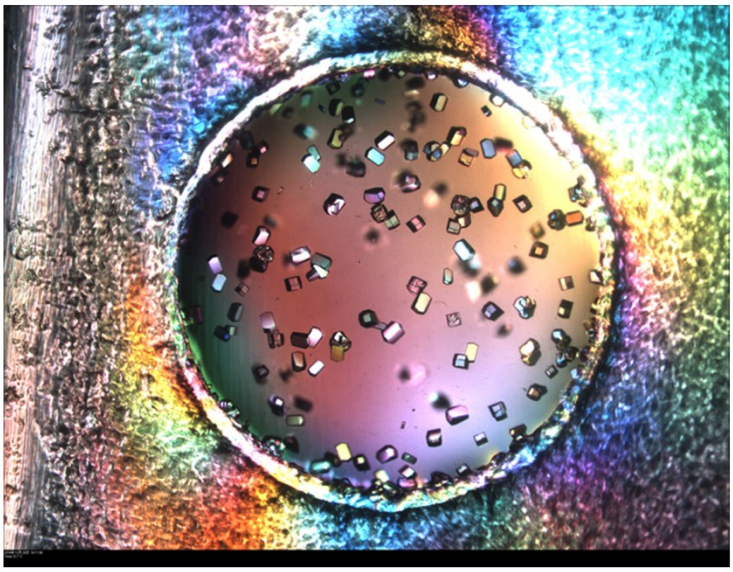
Supplementary Figure 2: FT-Raman spectra of carbon nanomaterials used. These results showed that the four used carbon nanomaterials displayed different Raman spectre. The results showed that G and D peak of graphene were 1580 cm^{-1} and 1350 cm^{-1}. MWCNT achieved more pronounced G and D peak at 1580 cm^{-1} and 1350 cm^{-1}. Corannulene achieved lower G peak and more pronounced D peak than perylene. These differences of FT-Raman indicated the various of CNMs in molecular structure and weight.

Supplementary 2: Lysozyme crystallization with various concentrations.



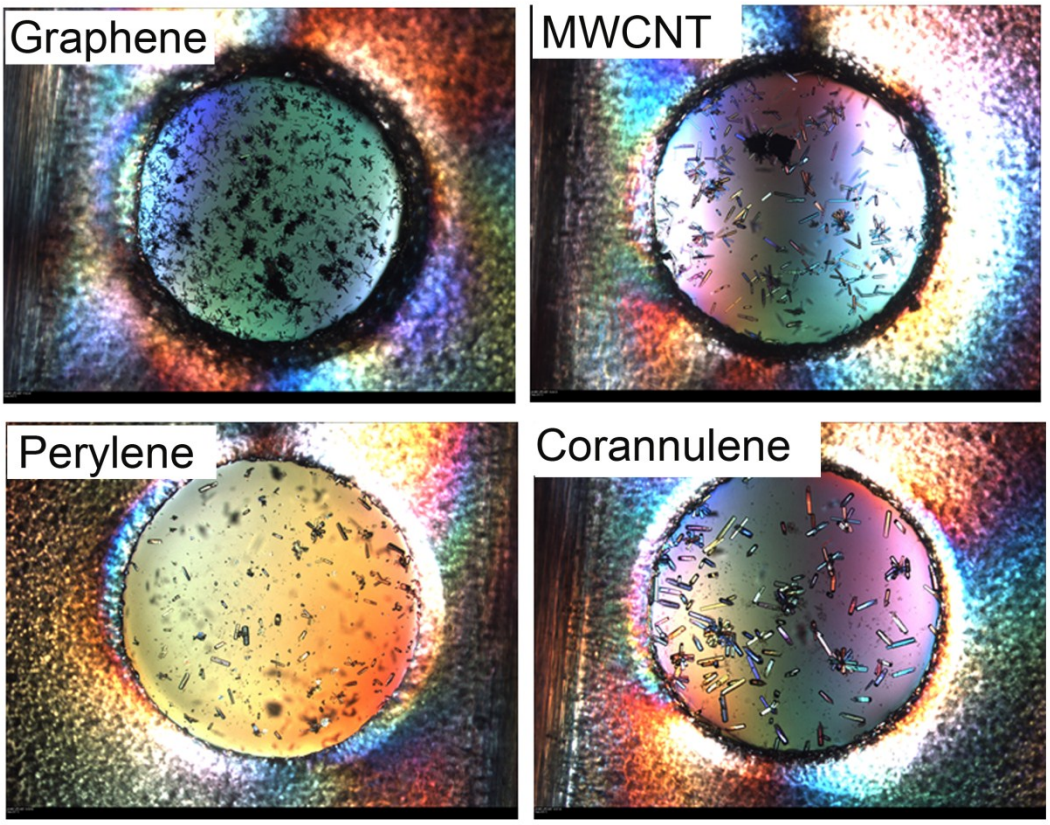
Supplementary Figure 2: Lysozyme crystallization with various concentrations. Lysozyme was prepared in 50 mM sodium acetate at concentrations of 20, 40, 60, 80 mg/ml. The results showed that lysozyme crystal has the most suitable density and size when lysozyme was prepared at concentration of 40 mg/ml. However, other concentration groups have a large crystal density and small size as lysozyme concentration was 60 mg / ml and 80 mg / ml, or has few in number of crystals as lysozyme concentration was20 mg / ml.

Supplementary 3: Lysozyme crystal without nucleating agents



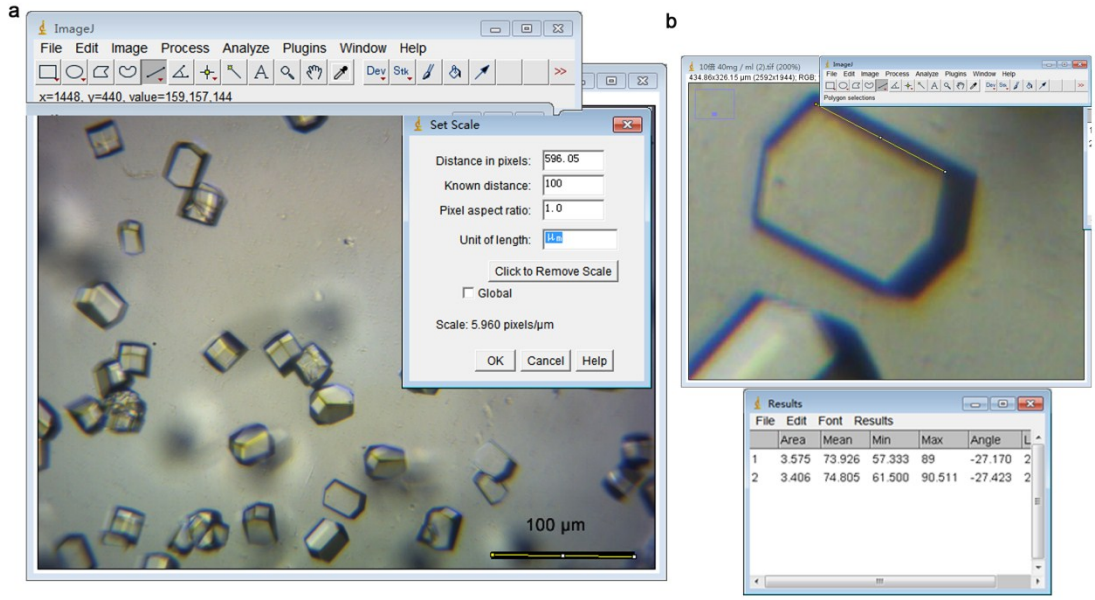
Supplementary Figure 3: Lysozyme crystal at 40 mg/ml. Polarisation micrograph of lysozyme crystal at 40 mg/ml. Lysozyme crystal displayed typical cube rhombic shape.

Supplementary 4: Lysozyme crystals with nucleating agents



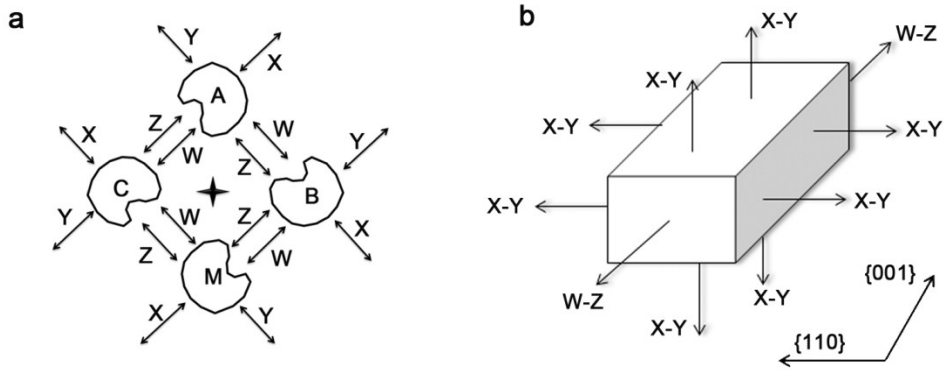
Supplement figure 4: Lysozyme crystal at 40mg/mL with carbon nanomaterials added as an nucleating agents. The results showed that added carbon nanomaterials changed the shape of lysozyme crystal. Adding perylene and graphene decreased both {110} and {001} faces length, but adding corannulene and MWCNT increased {110} face length.

Supplementary 5: Lysozyme crystal morphology statistics.



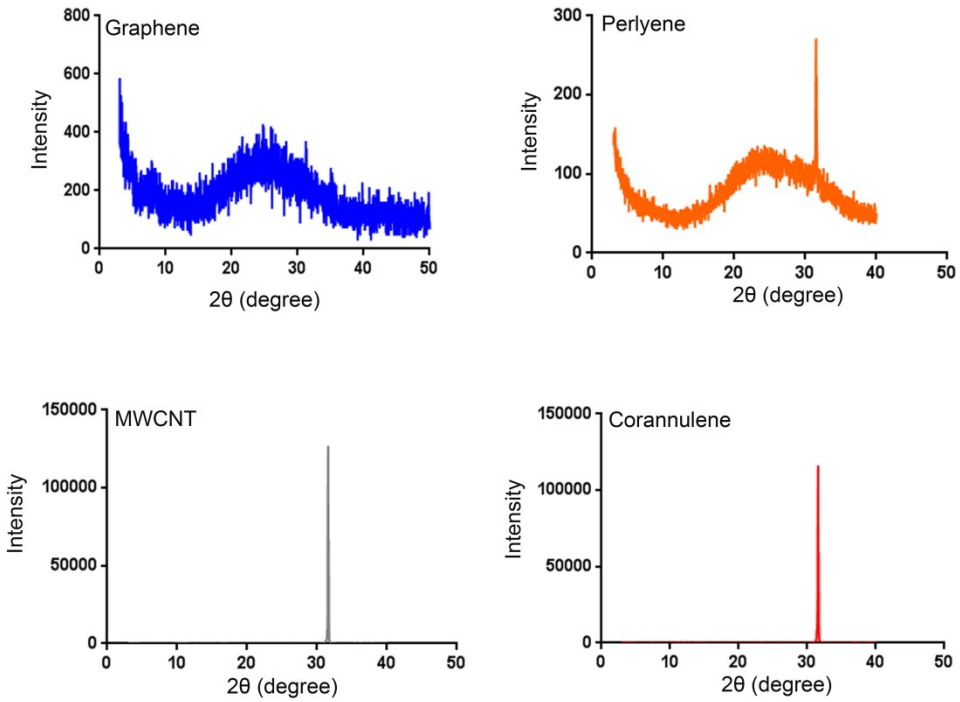
Supplementary figure 5: Methods of lysozyme crystal morphology statistics. We used Image J 14.8 to calculate the length of {110} and {001} faces. (a) First, distance in pixels, known distance, pixel aspect ratio and unit of length were defined according to the scale of images. (b) Selecting clear and straight lysozyme crystals determinate the length of crystals. Regarding the statistical results, each crystals were divided {110} and {001} faces. Every experimental groups were calculated 80-100 crystals.

Supplementary 6: XRD spectra of lysozyme crystal induced by carbon nanomaterials as nucleating agents.



Supplement figure 6: Lysozyme growth model. (a) The lysozyme molecular was combined by the bonding energies as the (a) showed. (b) ocramer is the basic units of lysozyme crystallization which X-Y:W-Z is about 1:2.

Supplementary 7: XRD spectra of lysozyme crystal induced by carbon nanomaterials as nucleating agents.



Supplementary figure 7: XRD spectra of lysozyme crystal induced by carbon nanomaterials. The results showed that adding MWCNT and corannulene displayed good XRD spectra, but adding graphene and perylene decreased the intensity of XRD of lysozyme crystal.