Electronic Supplementary Material (ESI) for CrystEngComm.

Supporting information

Structural Evolution and Phase Transition of Uniaxially Stretched Poly (butylene adipate-*co*-butylene terephthalate) Film as Revealed by *in-situ* Synchrotron Radiation Small and Wide Angle X-ray Scattering

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1. Orientation of PBAT lamellae during stretching as obtained from SAXS data.

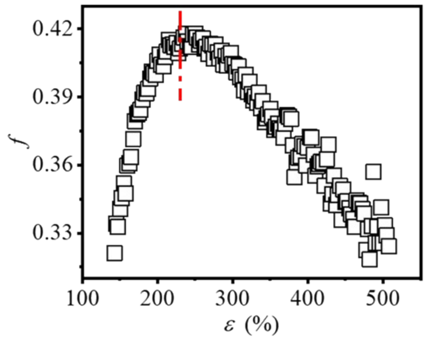

Figure S1. Orientation parameter of PBAT lamellae during stretching as obtained from SAXS data.

Figure S1 shows the orientation parameter of PBAT lamellae based on SAXS data. In the early stage of the stretching, the orientation factor could not be calculated since there are three kinds of orientation lamellar. When stain is beyond 140%, it is can be observed that the *f* increase with the increase of the strain. However, further increasing the strain, an obvious decline of the *f* can be found. It is observed from the 2D SAXS patterns that the crescentic streaks of SAXS pattern gradually separate more clearly with the increment of strain, indicating that crystal fiber appears. It is inaccurate to use Hermans equation to calculate the orientation of crystal fiber. Thus, it is hard to associate orientation information obtained from SAXS data with the phase transition.

2. The influence on the transmittance caused by the sizes of spherulite.

It is considered that the sizes of spherulite may also play a role for the transmittance of the film. The AFM (Atomic Force Microscopy), POM (Polarized Optical Microscope) and SALS (Small Angle Light Scattering) (Distance from the sample to the detector is 45mm. The wavelength of Helium-neon gas laser is 623nm) tests are carried out to prove whether the size of spherulite have an influence on transmittance. In Figure S2, the effect of surface roughness on transmittance can be ruled out because there is no significant change in surface roughness during stretching. From the POM results in Figure S3, it seems that there are many fine grains before stretching, and these grains are hard to be observed after stretching. However, the SALS results (see Figure S4) shows almost no changes between samples before and after stretching. The SALS can be used to quantitatively calculate particle scales on the micrometer scale. These results reveal that perhaps the change in transmittance is related to the change in the size of the micron-sized particles, but the available experimental evidence is not sufficient to support this view.

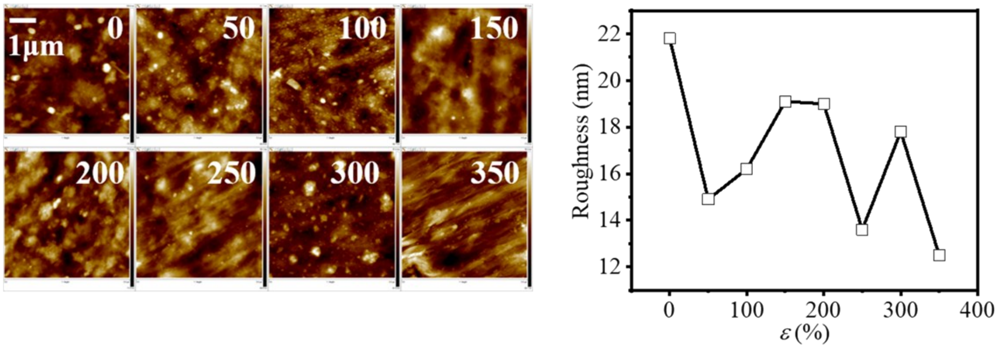

Figure S2. Atomic force microscopy (AFM) images of PBAT films under different strain conditions together with the corresponding surface roughness.

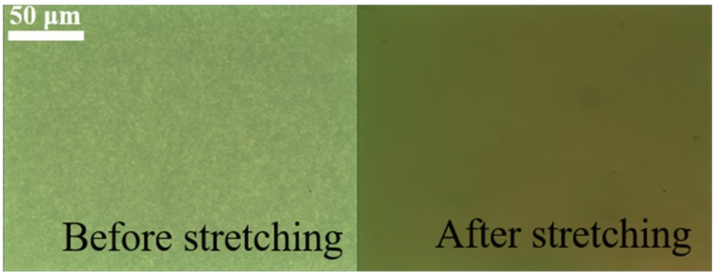

Figure S3. Polarized optical microscopy (POM) images of PBAT film before and after stretching.

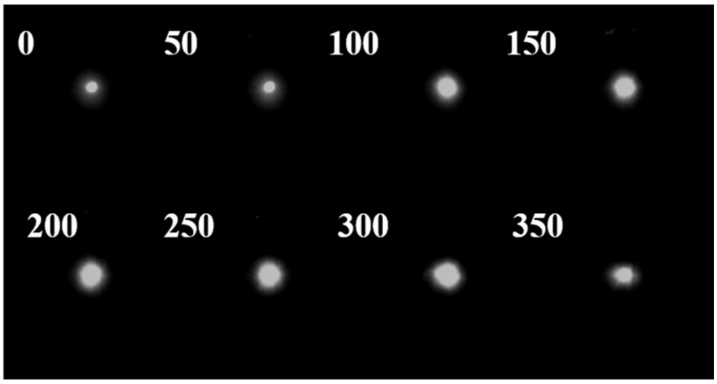

Figure S4. Small angle light scattering (SALS) patterns of PBAT film during stretching.