Supplementary Material for

The γ → β phase transition behavior of polyvinylidene fluoride under uniaxial drawing

Mengting Feng[1#], Ruru Wan[1#], Jian Hu[2], Huihui Li[1], Shaojuan Wang [2], Shouke Yan, [1,2]* Xiaoli Sun[1]*

[1] State Key Laboratory of Chemical Resource Engineering, Beijing University of Chemical Technology, North Third Ring Road 15, Beijing, 100029, China (xiaolisun@mail.buct.edu.cn)

[2] Key Laboratory of Rubber-Plastics of Ministry of Education, Shandong Provincial Key Laboratory of Rubber-plastics, Qingdao University of Science & Technology, No.53 Zhengzhou Rd Qingdao 266042, China

[#] Mengting Feng and Ruru Wan contribute equally to the work.

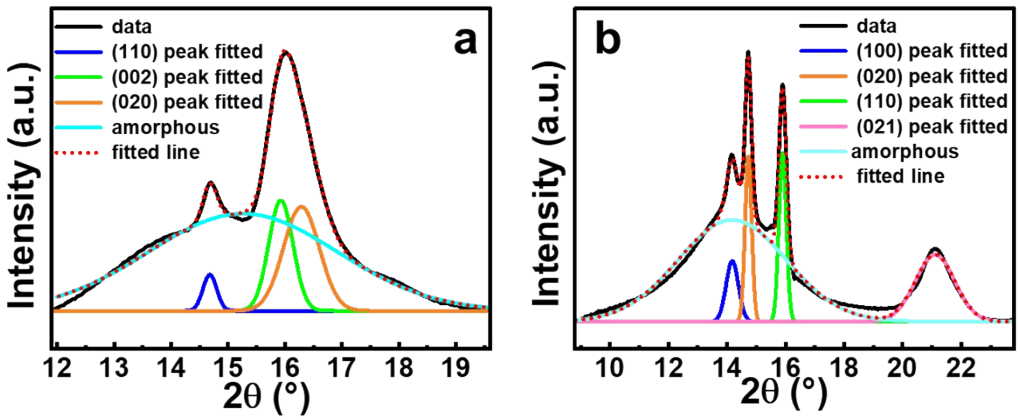

Fig. S1 Curve-fitting analysis for the WAXD pattern of γ- (a) and α-PVDF (b).

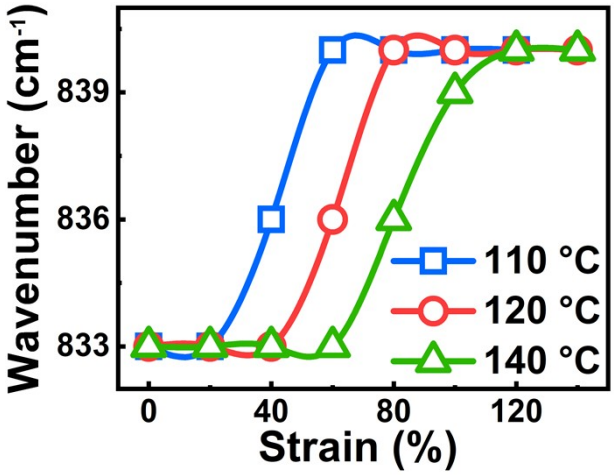

Fig. S2 The shift of infrared band at 833 cm^{-1} for γ-PVDF crystals to 840 cm^{-1} for β-PVDF crystals against strain during stretching at different temperatures with a stretching rate of 900 μm/s.

Fig. S2 shows the shift of infrared band from 833 cm^{-1} for γ phase to 840 cm^{-1} for β phase under stretching at different temperature with a stretching rate of 900 μm/s, indicating the occurrence of γ-β transition. In addition, it was found that the efficiency stretching temperature of obtaining β phase is 110 °C.

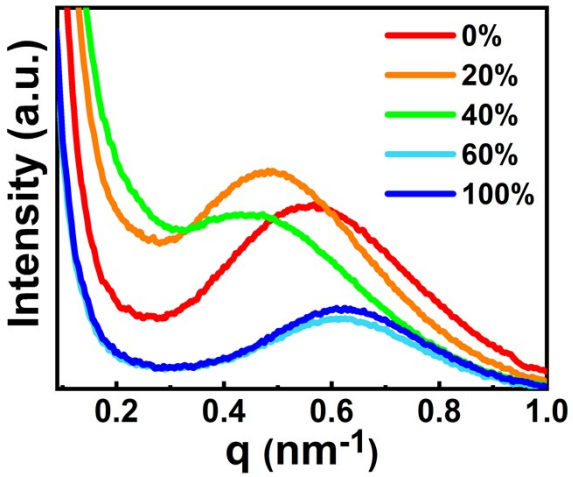

Fig. S3 1D SAXS profiles obtained along stretching direction corresponding to Fig. 5a.

1D SAXS profiles obtained along stretching direction of γ-PVDF sample at 110 ℃ with a stretching rate of 900 μm/s corresponding to Fig. 5a shown in Fig. S3. When the $\varepsilon \leq 40\%$, the peak position shifts toward the lower q value during stretching, which may be caused by the increase in interlamellar distance and lamellar thickness under stretching. With further stretching, the peak position shifts to the higher q value, indicating that the destruction of lamellae due to the applied force.

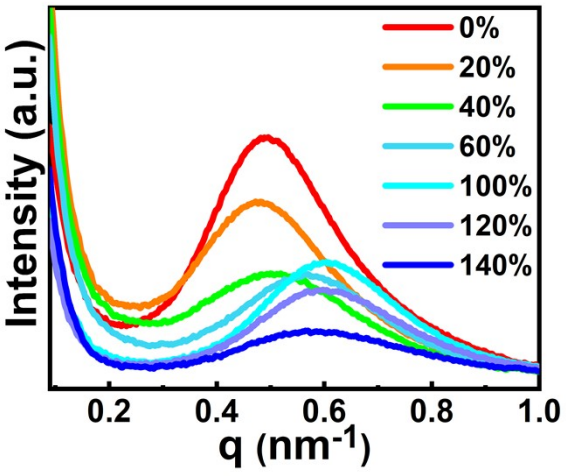

Fig. S4 1D SAXS profiles obtained along stretching direction corresponding to Fig. 7a.

Fig. S4 presents the 1D SAXS profiles obtained along stretching direction of α-PVDF sample at 110 ℃ with a stretching rate of 900 μm/s corresponding to Fig. 7a. With increase of stretching ratio, the peak position continuously shifts to larger q value at $\varepsilon \leq 100\%$, and then remains essentially unchanged with further stretching, suggesting that the decrease of l_{ac} caused by thinning of the crystalline lamellae and the amorphous region resulting from the fragmentation of original lamellae into crystallites.