Electronic Supplementary Material (ESI) for Soft Matter.

Supporting Information

Facilely Assess The Soluble Behaviour of β-Nucleating Agent by Gradient Temperature Field for Construction of Heterogeneous Crystalline-Frameworks in iPP

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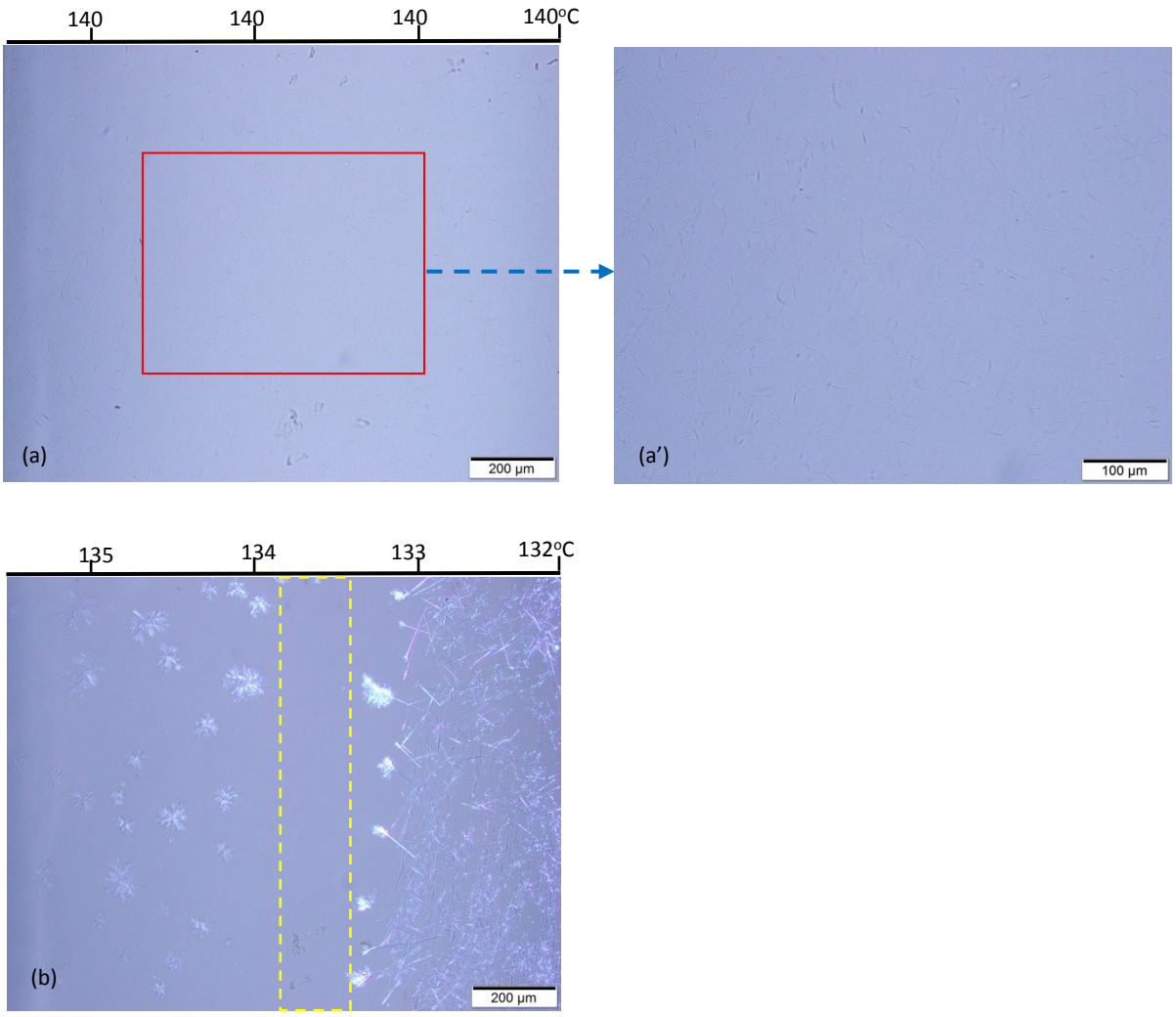

Fig. S1 Nucleation morphology of the specimen with 0.05 % β-NA obtained via (a) homo-T field and (b) g-T field treatment. Both of (a) and (b) were achieved on the same specimen under the same observed window. The T_f in homo-T field is 195 °C, while the T_f range for g-T field is within 217 to 220 °C. The cooling rate was fixed as 5 °C/min, and (a) was acquired at 140 °C and (b) at around 134 °C.

A comparative analysis between homo-T field and g-T field is presented as Fig. S1. The specimen was undergone by homo-T and g-T field sequentially. Numerous microfibril-like entities are found everywhere in Fig. S1(a), especially in an amplification view-field, after experienced homo-T field. It indicates an extremely uniform dispersion of β-NA substance in the initial specimen. However, under the same observation window, by suffering the influence of g-T field the distinct blank zone in which no nucleation affair occurred is emphasized by yellow dash-line rectangle, as shown in Fig. S1(b), indicating that β-NA components originally existed in this zone have migrated to the prior-formed NA frameworks.

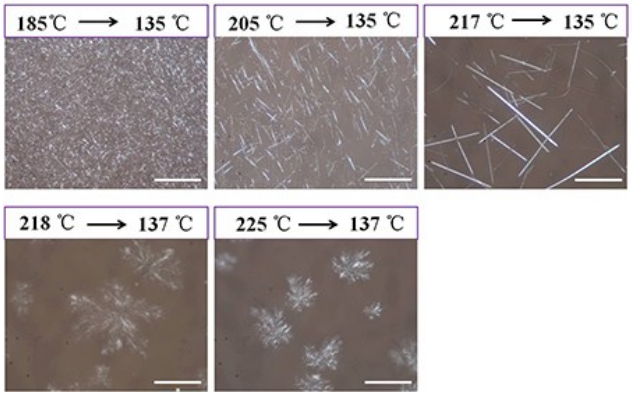

Fig. S2 Morphological photographs of crystalline framework generated in the iPP/WBG-Ⅱ specimen with 0.1 % β-NA (the scale bar is 100 μm)

The morphologies of β-NA framework in the specimen with 0.1 % WBG-Ⅱ are demonstrated as Fig. S2. The morphological features and the rule of construction of β-NA crystalline framework as a function of T_f are almost same to the case of 0.3 % concentration, except for the dendritic entities are more dense and with significantly smaller size. This difference in dendritic morphology is due to the absolute amount of WBG-Ⅱ reduced substantially. In accordance with expectation, the abrupt change from needle to dendrite is also identified, and the critical T_f of entirely dissolvable β-NA is 218 °C at this WBG-Ⅱ concentration, which is well accordance with the result achieved under g-T field (seeing Fig. 2).

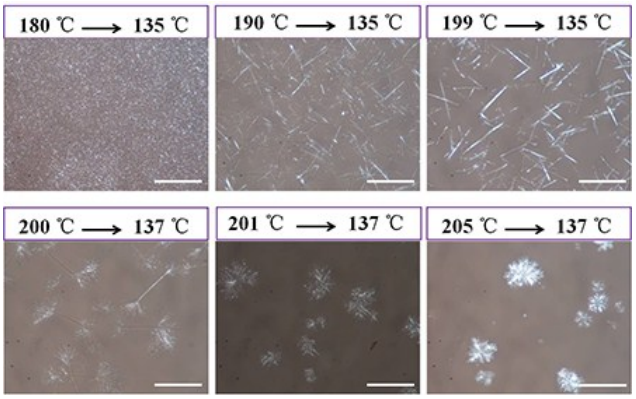

Fig. S3 Morphological photographs of crystalline framework generated in the iPP/WBG-Ⅱ specimen with 0.05 % β-NA (the scale bar is 100 μm)

As to a lower concentration, 0.05 %, the flower-like supermolecular structure appears between needles and dendrites, as showing in Fig. S2. It should be noted that the transformations from needle to flowers, then to dendrites are all over a narrow temperature scope of 1 °C, and the critical T_f for the full solubility of β-NA is determined at 201 °C. Obviously, the more the β-NA amount, the higher the critical T_f is received.