

Electronic Supplementary Information(ESI)

**Localized Self-Assembly and Nucleation: A New Strategy for
Preparing Highly Toughened Polymer Blends**

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Materials

Polyamide 66 (trade name: EPR 27) was provided by Shenma Engineering Plastic Company (Henan, China);

Isotactic Polypropylene (trade name: T30S) was provided by Dushanzi Petroleum Chemical Incorporation (Xinjiang, China). The weight average molecular weight was 400 kg/mol and the isotacticity was 95~96.5 %;

Aryl amide-based β nucleating agent (trade name: TMB-5) was supplied by Shanxi Provincial Institute of Chemical Industry (Shanxi, China).

Sample Preparation

Masterbatch preparation

PA66 and NAs (1wt%) was premixed through twin screw extruder (SLJ-30, L/D =32, Longchang Chemical Machinery Plant, China). and then the NAs-PA66 master batch and pure PA66 were respectively pulverized into powder by high-speed pulverizer (FW-400A, Beijing Zhongxing Weiye, Instrument Company, China).

Samples for Polarized Optical Microscope (POM) and Scanning Electron Microscope (SEM):

Sandwich-type composites with NAs-PA66 and neat PA66 powders sprinkled in between two iPP slices were fabricated by hot-compression in a hot-stage at 190 °C.

Samples for Mechanical Tests:

the NAs-PA66 and neat PA66 powders were co-pulverized with iPP powders using high-speed pulverizer. The iPP powders were dried and pre-pulverized before use. The concentration of NAs-PA66 master-batch and pure PA66 in PP matrix was 5 wt% in this study.

Charaterization

Polarized Optical Microscope (POM) observation

The sandwich-type composites were observed by polarized optical microscope, which was equipped with a heating stage (Linkam THMS600, Linkam Scientific Instruments Ltd., UK). The samples were heated to 270 °C at a rate of 50 °C/min and then cooled down to 140 °C at a rate of 30 °C/min. The morphology changes in the systems were recorded by digital camera.

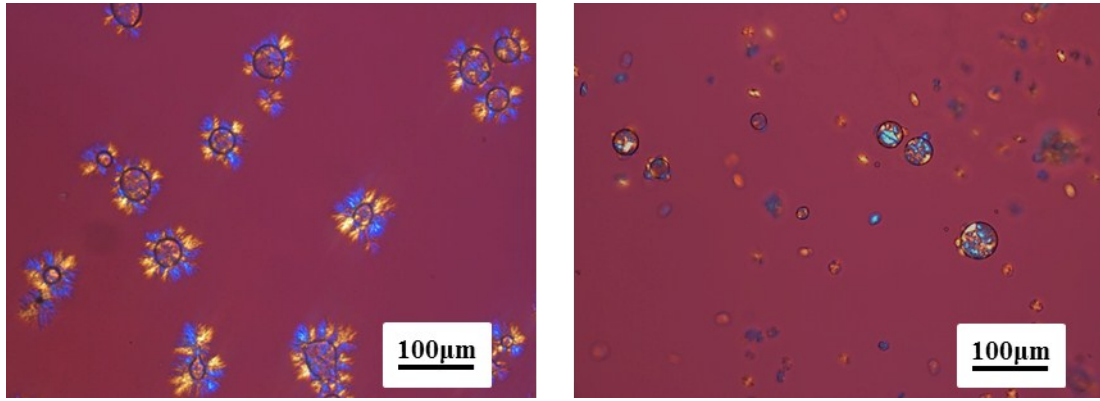
Scanning electron microscope (SEM) observation

The crystal structure of the composites was investigated by a FEI Inspect F-SEM instrument with an acceleration voltage of 20 kV. Before the test, the samples were etched in permanganate etchant for 0.5 h, and then rinsed by diluents sulfuric acid, hydrogen peroxide and acetone successively. The etched surface was gold-sputtered before observation.

Mechanical test

The impact strength was measured on an izod machine XBJ-7.5/11 (Changchun Testing Machine Co., Ltd.). The samples were prepared via compression-molding firstly at 270°C, then kept for 2 minutes at 140 °C before cooled down to room temperature. Subsequently, the samples were punched into impact testing bars (80mm*10mm*2mm). To test the low-temperature impact resistance properties of the composite, we measured the impact strength of notched samples after 24h cryopreservation at -10 °C. Five samples were tested for averaged values.

The tensile behavior was measured on a universal testing machine (Shenzhen Reger Instrument Co.) at a tensile rate of 50 mm/min. The dumbbell-shaped samples were kept at room temperature for 24h before test. Five samples were tested for averaged values.



ESI-Figure 1: Low magnification images showing universal crystallization behavior of NAs-PA66/iPP (Left) and PA66/iPP (Right)