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Advanced Materials Research Institute

Science Bridges China Research

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SUMMARY OF MY RELEVANT RESEARCH AREAS:

English Advanced Polymer processing, Computer simulation of injection molding process

Chinese 聚合物先进加工技术，注塑成型计算机模拟

Primary Research interests:

1. Vibration injection moulding (PVIM), one of the 'melt manipulation' techniques, is an advanced technique to modify the structure and properties of parts. During vibration injection moulding, an oscillating shear field is imposed on the polymer melt, which would increase the degree of oriented morphology/structure of melts as much as possible, thus affords a high possibility to the development the properties of parts. Abundant structure were observed first in the PVIM iPP samples, i.e. Shish-kebab-like cylindrulite and banded spherulites. For the PVIM iPP/MWCNT composite, the oscillating shear field makes MWCNT oriented along the flow direction and individual MWCNT made contact with one another directly to form perfect conducting paths, which effectively increased the electrical conductivity of the composite and reduced the percolation threshold.

2. Micro-injection moulding (MIM) is one of the most promising technologies for the production of micro-parts. The specific thermo mechanical environment in MIM can affect the various steps of crystallization of semi-crystalline polymers, resulting in a specific morphological feature and special physical properties. The combination of higher shear rates and faster cooling speeds affects the formation of highly oriented structures with large fraction, resulting in a higher crystallinity and large fraction of oriented region in micro-part. For the MIM HDPE sample, the special K–M II morphology was found for the first time in micro-part.

3. Computer simulation technology was mainly carried out to the research and application of polymer processing. Cooperated with many enterprises, many problems have been solved in the injection moulding process.

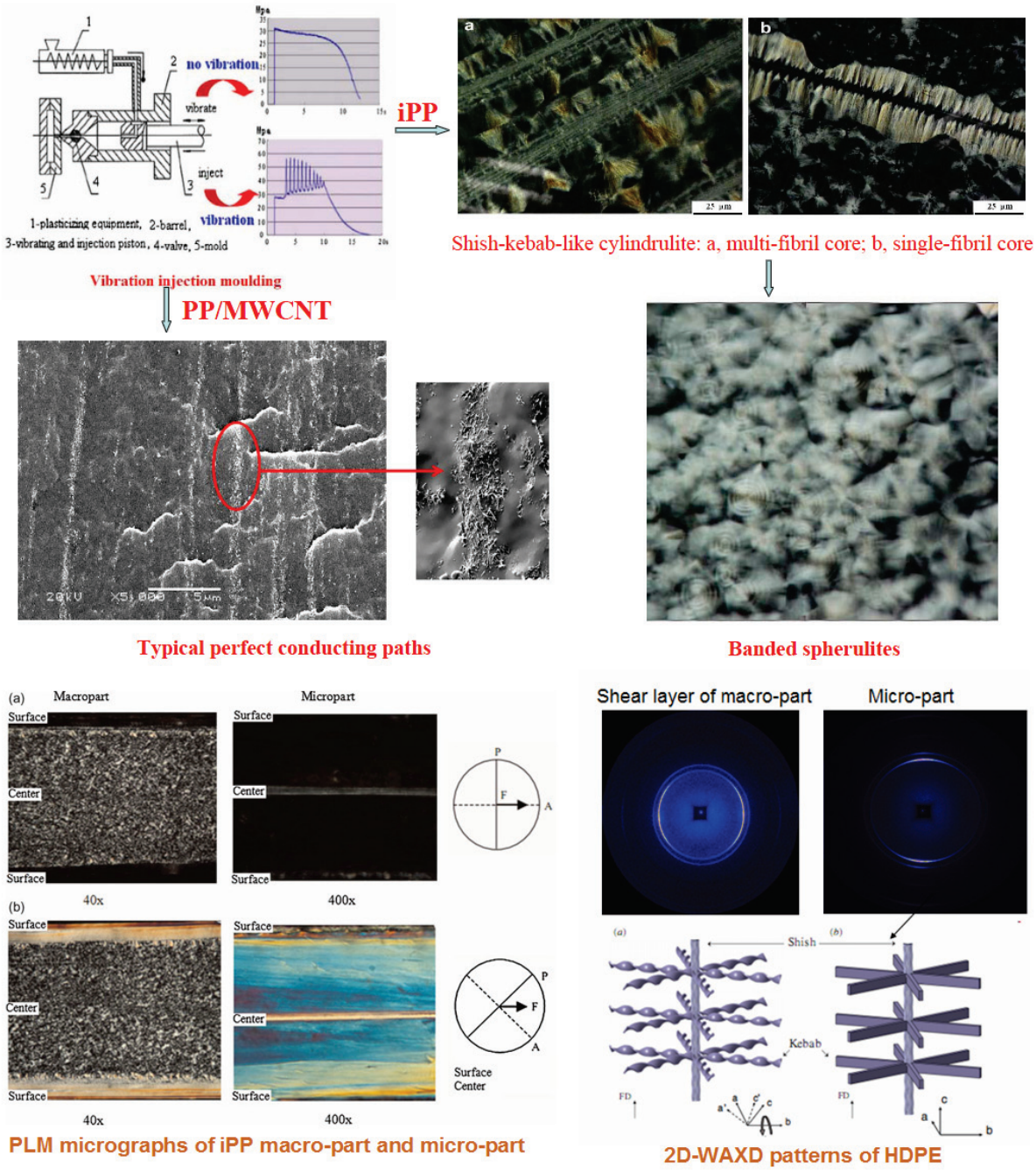
Topics in which you would like to develop collaborative research:

- **Vibration injection moulding of functional polymer materials**
- **Micro-processing of polymer materials**

Relevant existing collaborations (academic/clinical/commercial) inside or outside China.

None

Relevant graphics, figures, pictures:



Publications and other outputs relevant to your interest in this programme

1. Liangbo Yang， Fanghui Liu, Hesheng Xia, Xinyuan Qian, Kaizhi Shen, Jie Zhang*.Improving the electrical conductivity of a carbon nanotube/polypropylene composite by vibration during injection-moulding. Carbon,2011,49(10):3274-3283
2. Qixiong Zhou, Fanghui Liu, Chao Guo, Qiang Fu, kaizhi Shen, Jie Zhang*.Shish-kebab-like Cylindrulite Structures Resulted from Periodical Shear-induced Crystallization of Isotactic Polypropylene.Polymer,2011,52(13):2970-2978
3. Fanghui Liu, Chao Guo, Xian Wu, Xinyuan Qian, Hong Liu, Jie Zhang*. Morphological comparison of isotactic polypropylene parts prepared by micro-injection molding and conventional injection molding.Polymers for Advanced Technologies, 2012, 23(3):686-694.
4. Zhang, Jie; Shen, Kaizhi; Na, Shun; Fu, Qiang. Vibration-induced change of crystal structure in isotactic polypropylene and its improved mechanical properties. Journal of Polymer Science, Part B: Polymer Physics, 2004, 42(12): 2385-2390
5. Zhang, Jie; Shen, Kaizhi; Gao, Yuegin; Yuan, Yi. Mechanical properties and structure of high-density polyethylene samples prepared by injection molding with low-frequency vibration. Journal of Applied Polymer Science, 2005, 96(3): 818-823