Research Profile

Name: Dr. Ning Chen

Position: lecturer
Institute/division: State Key Lab of Polymer Materials Engineering, Polymer Research Institute, Sichuan University
Email: ningchen@scu.edu.cn
Tel: +86-28-85405133, +86-13551191850

SUMMARY OF MY RELEVANT RESEARCH AREAS:

Thermal Processing of Poly (vinyl alcohol)(PVA), High Performance Polymeric Fibre, Micro-injection moulding and 3D Printing of Polymer Based Functional Micro/Nano composites

聚乙烯醇热塑加工新技术，高性能聚合物纤维，聚合物基微纳米功能复合材料的微成型加工和 3D 打印加工

Primary Research interests:

1. New technology for thermal processing of poly(vinyl alcohol) :
   - Adopting molecular complexation and plasticization to obtain the thermal processing window of PVA and realize its extrusion, melt spinning, thermal blowing, injection moulding, etc. the higher performance PVA fibers, films, sheets and hollow containers were obtained.
   - Synthesized thermoplastic PVA by controlling the comonomer, the side chain length and distribution, as well as the crystallinity of PVA. A small amount of long-chain branched comonomer can significantly improve the thermal stability of PVA, decrease its melt point. The Thermal processing window of PVA was over $90^{o}C$ when the ratio of comonomer was about 4%.

2. Preparing high performance and multi-functional PVA based composites, such as PVA/HA, PVA/TCP, suitable for micro-processing by combing the molecular complexation and the solid state shear milling (S^3M) technology and realizing the micro-injection moulding of PVA and PVA based functional composites, which has potential application in biomedical field.

3. Preparing functional polymer blends and polymer based micro/Nano composites suitable for 3D printing by combing the molecular complexation and S^3M technology. Realizing fused deposition modelling(FDM) of PVA blends and PVA based composites, such as PVA/PLA, PVA/PLA/HA. Realizing selective laser sintering (SLS)of polymer based micro/Nano composites, such as PA11/ TiBaO3 Piezoelectric Composites.

Topics in which you would like to develop collaborative research:
- **High performance and multi-functional environment-friendly polymer based composites used for 3D printing and micro-injection moulding**
- **Application of PVA-based composites in biomedical field**

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

Collaboration with the Polymer IRC at University of Bradford in polymer micro-injection moulding and the PVA based composite used for joint soft tissue repair.
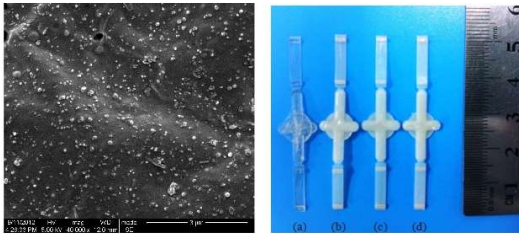
Relevant graphics, figures, pictures:
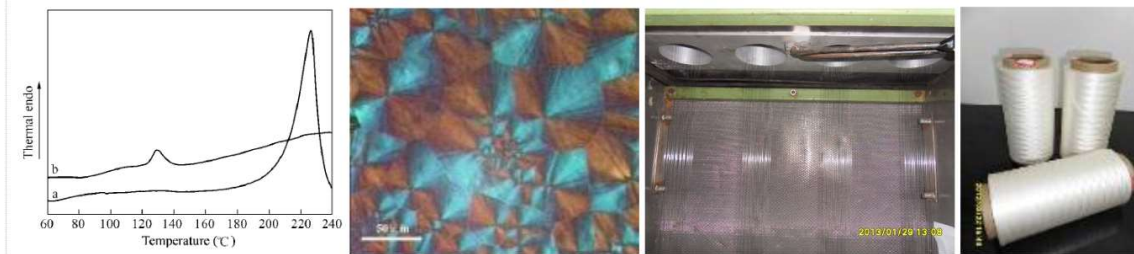
DSC endotherms of PVA (a) and modified PVA (b) using high-pressure stainless steel pan

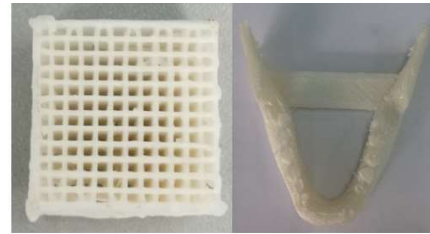*Polarizing light micrographs of PVA crystallized from melt*

The melt spinning of PVA fiber for medium scale production

Photo of PVA as-spun fibers

SEM photo of PVA/n-HA composite with 30 wt.% n-HA prepared by solid state shear milling

Micro-injection samples of PVA/n-HA composites. (a) PVA, (b) 10%HA, (c) 20%HA, (d) 30%HA.

PVA based biological scaffold (left) and human jaw model(right) processed by fused deposition modelling

Publications and other outputs relevant to your interest in this programme (up to 5)

1. N. Chen, L. Li and Q. Wang. New technology for thermal processing of poly(vinyl alcohol). Plastics, Rubber and Composites, 2007, 36(7-8): 283-290

2. Qian Wu, Ning Chen, Qi Wang. Crystallization behavior of melt-spun poly (vinyl alcohol) fibers during drawing process. Journal of Polymer Research, 2010, 17: 903-909

3. Li Li, Ning Chen, Qi Wang. Effect of Poly(ethylene oxide) on the Structure and Properties of Poly(vinyl alcohol). Journal of Polymer Science: Part B: Polymer Physics, 2010, 48: 1946-1954

4. Yu-jun Yang, Ning Chen, Qi Wang, Thermal-processing properties of polyvinyl alcohol/gelatin/nano-hydroxyapatite composites. Acta Polymerica Sinica, 2014, (7): 956-962

5. Huan Wang, Ning Chen, Qi Wang, Interaction Between Tricalcium Phosphate and Poly(vinyl alcohol) and Its Effect on the Thermal and Mechanical Properties of Poly(vinyl alcohol), Chemical Journal of Chinese Universities,2-14, 35(8):1810-1815