BRITISH COUNCIL

RESEARCHER LINKS

Newton Fund

Research Profile

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SUMMARY OF MY RELEVANT RESEARCH AREAS:

Oriented self-reinforced polymers; Solid phase processing technology of polymer materials; Structure and blood/bio-compatibility of highly oriented poly(lactic acid) produced by solid hot drawing; Controlled drug release system; Chitosan based intelligent hydrogel

取向自增强高分子材料设计与制备；高分子材料固相加工技术；固相热拉伸技术制备高度取向 PLA 结构及血液/生物相容性；药物可控释放体系；壳聚糖基智能水凝胶

Primary Research interests: *A fuller description of your main research areas.*

Structure and blood/bio-compatibility of highly oriented poly(lactic acid) (PLA)-based materials produced by solid hot drawing: Oriented PLA/polyurethane blends with enhanced blood compatibility; Oriented PLA/MWNTs composites with improved mechanical properties and blood compatibility; Structure and blood compatibility of highly oriented PLA by chain extension; Fibrillation of chain branched PLA with bionic structure; Structure and biocompatibility of long chain branched PLA produced by one/two-dimensional orientation

Controlled drug release system: Preparation and drug release behavior of pH-responsive chitosan microspheres; Synthesis of cationic chitosan hydrogel and its controlled glucose-responsive drug release behaviour; Glucose-responsive drug release behaviour of cationic chitosan hydrogel with long chain alkyl; Chitosan/GO nano-composite hydrogel for controlled pH- and glucose-responsive drug release application

Topics in which you would like to develop collaborative research:

Preparation of PLA bone fixation material through solid hot stretching microfibrillation and its biological properties

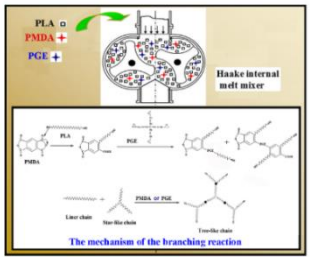
Bone fracture is very common among osteoporotic patients for the aged, and more than half of them require bone implants for fixation. Conventionally, bone implants used for fracture fixation are made of stainless steel, titanium or titanium alloy, which are far harder than osteoporotic fracture bone, and a second operation to remove them after recovery may be required. Poly (lactic acid) (PLA), a linear aliphatic thermoplastic polyester derived from renewable resources, has been approved by the FDA for numerous clinical applications due to its biodegradable and biocompatible nature. This project will focus on the development of self-reinforced PLA as bone fixation materials for aged osteoporosis patients. PLA with strain hardening rheological behavior will be prepared and the solid die drawing technology of PLA will be established to realize the high orientation and microfibrillation, for the purpose of the dramatic enhancement of mechanical properties, promoting the formation of an oriented orderly bionic structure similar to bone collagen fiber, slowing down the molecular degradation and strength decay rate, and controlling the shape memory effect. And thus the PLA bone fixation materials with ideal repair effect of bone defect and excellent biological properties of controllable degradation and self-fastening will be achieved.

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

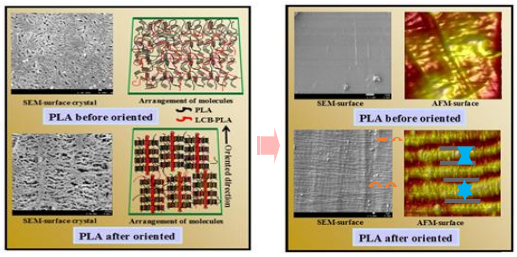
Include here any relevant collaborations you have

- Sub-project of Science Bridge China project (cooperation with Bradford university)
- International Scientific and Technological Cooperation Project of Sichuan Province (cooperation with Bradford university)

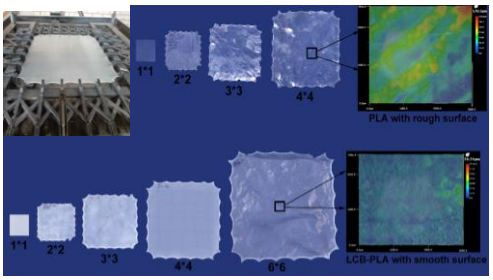
Relevant graphics, figures, pictures:

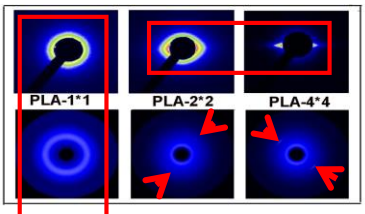


PLA was long-chain-branched by ring-opening reaction through reactive processing

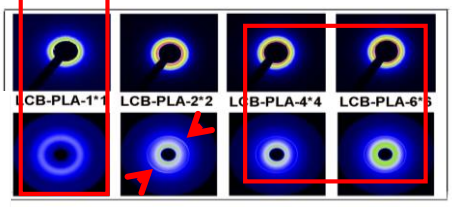


Bionic character of uniaxial oriented LCB-PLA

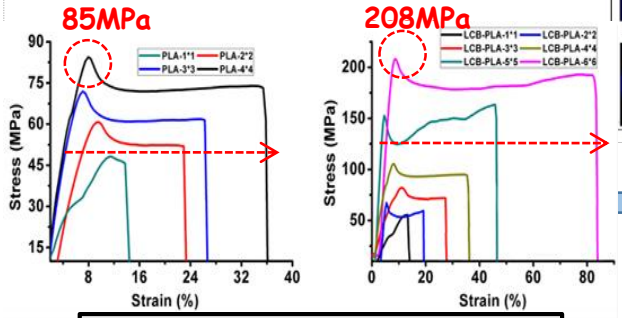




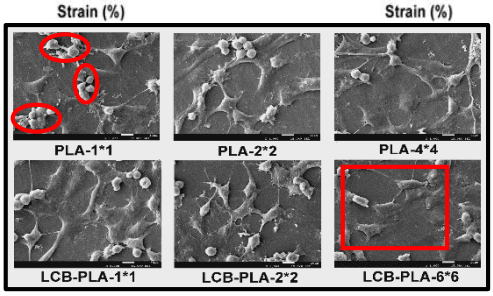
During biaxial orientation, non-uniform deformation occurred for PLA

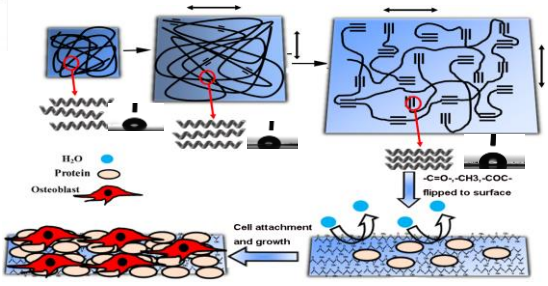


Homogeneous orientation can be observed for LCB-PLA



After biaxial orientation, the mechanical property of LCB-PLA can basically meet the requirement for bone fixation.





Mechanism of enhanced biocompatibility for biaxial oriented LCB-PLA

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

1. Zhengqiu Li, Xiaowen Zhao*, Lin Ye, Phil Coates, Phil Caton-Rose, Michasel Martyn, Chemical Engineering Journal (IF: 4.058), 2015, 279(1):767
2. Zhengqiu Li, Xiaowen Zhao*, Lin Ye, Phil Coates, Fin Caton-Rose, Michasel Martyn, Polymer (IF: 3.766), 2015, 56(15): 523
3. Zhengqiu Li, Xiaowen Zhao*, Lin Ye, Phil Coates, Phil Caton-Rose, Michasel Martyn, Journal of Biomedical Materials Research Part A (IF: 3.263), 2016, 104: 1082
4. Zhengqiu Li, Xiaowen Zhao*, Lin Ye, Phil Coates, Phil Caton-Rose, Michasel Martyn, Journal of Biomaterials applications (IF: 2.764), 2014, 28: 978
5. Zou Xue, Xiaowen Zhao*, Lin Ye, Chemical Engineering Journal (IF: 4.058), 2015, 273: 92