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STUDY OF SHAPE MEMORY POLYMER COMPOSITE FOR BONE REPAIRING

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As one of the most important organ in the body, bones always play a key role for supporting body and protecting the soft tissues. However, with the population aging, bone defect becomes a common situation owing to bone fracture, osteoporosis, diseases and so on. Traditional treatments including bone grafts and conventional metal implantations have apparent drawbacks during the procedure of bone repairing such as time-consuming, labor-intensive and inflammation-responsive, thus synthetic materials especially the polymer materials have gained increased attractions. Nowadays, these materials have been applied for bone repairing even in the clinical trials. Shape memory polymers (SMPs) as one of the smart synthesized materials have attracted many attentions because of their unique features. SMPs can achieve the function, can memorize deformed shapes and recover when exposed to an external stimulus, which is different from other biomedical materials. Also, the shape and size even the properties can be designed to meet various demands. In this study, the shape memory polyurethane was modified with HA and RGD to fabricate the SMP/HA/RGD composite. Then, the structure, mechanical properties and shape memory behaviour were characterized. Furthermore, the biocompatibility and the biomechanical properties were investigated. In present study, we propose a new adaptable function offered by the SMP composite bone screw that is the realization of balance among bio-performances. The relationship among SME, tissue growth and biomechanical properties was discussed to further reveal and explicate the adaptable function.

Recent Publications:

1. Baker R M, Tseng L F, Iannolo M T, Oest M E and Henderson J H (2016) Self-deploying shape memory polymer scaffolds for grafting and stabilizing complex bone defects: a mouse femoral segmental defect study. *Biomaterials*. 76:388-398.
2. Heidari B S, Oliaei E, Shayesteh H, Davachi S M, Hejazi I et al. (2016) Simulation of mechanical behavior and optimization of simulated injection molding process for PLA based antibacterial composite and nanocomposite bone screws using central composite design. *J Mech. Behav. Biomed. Mater.* 65:160-76.
3. Hu J, Zhu Y, Huang H and Lu J (2013) On the origin of the Vogel–Fulcher–Tammann law in the thermo-responsive shape memory effect of amorphous polymers. *Progress in Polymer Science*. 37:1720-1763.
4. Lendlein A and Langer R (2002) Biodegradable, elastic shape-memory polymers for potential biomedical applications. *Science*. 296(5573):1673-1676.
5. Xie T (2010) Tunable polymer multi-shape memory effect. *Nature*. 464:267-270

Biography

Yuanchi Zhang is a PhD student from Institute of Textiles and Clothing, Hong Kong Polytechnic University, Hongkong. His research topic involves shape memory polymer composite for biomedical application. He is interested in polymer, biomaterials, functional materials and bone repairing.

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