Wei Zhang et al., J Material Sci Eng 2016, 5:3(Suppl)
http://dx.doi.org/10.4172/2169-0022.C1.038

Plasma generated nitrogen functionalities on polymeric bone implants for upregulating osteogenesis

Wei Zhang, Jun Liu, Gexia Wang, Junhui Ji and **Fengqi Wang**
The Chinese Academy of Sciences, P.R. China

Surface chemcial group is proved to be an important signal to to modulate osteogenic differentiation of bone related cells on polymeric bone implant. Previous reports show that nitrogen plasma is an useful tool to produce nitrogen functionalities to signal BMSCs to differentiate down to osteoblasts. However, the effects of each nitrogen functionality such as primary, secondary, and tertiary amines on these cells are ambiguous and sometimes contradictory because the inherently complicated chemical structure of many polymers makes it difficult to controllably produce one of these nitrogen groups by plasma technology. Herein, it describes a strategy to controllably construct nitrogen functionalities on polymers by plasma immersion ion implantation (PIII). Our results find that argon plasma bombardment can dissociate mainchain and generate pyrolytic carbon as the platform to generate primary, secondary, or tertiary amines using subsequent nitrogen or hydrogen PIII. On the platform of single carbonaceous structure, only nitrogen PIII (noted as PArN) generates dominant tertiary amine among these gourps. After additional hydrogen PIII, the dominant chemical groups gradually vary from tertiary amine to secondary and primary amines. Further, gene and protein expression anaysis show BMSCs have the optimal osteogenesis related gene expression inculding Runx-2, OCN and BMP-2 on tertiary amines (PArN). These genes expression and calcification levels are positively correlated with the percentage of tertiary amine in the nitrogen plasma-modified surface. Therefore, using our strategy, the genenerated tertiary amines has been shown to specifically direct BMSCs to differentiate to accomplish osteogenesis.

Biography

Wei Zhang has completed his PhD from Technical Institute of Physics and Chemistry (TIPC), The Chinese Academy of Sciences (CAS) in January 2007. After that, he joined National Institute of Advanced Industrial Science and Technology (AIST), as Japan Society for the Promotion of Science) fellow. After Decemebr 2009, he returned to TIPC of CAS. Now, he is the Director of antibacterial materials center of TIPC, and his study focuses on antibacterial medical materials. He has published more than 40 papers in reputed journals, such as biomaterials, polymer, advanced materials.

weizhang@mail.ipc.ac.cn

Notes: