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Biomaterialized (CaCO₃) bacterial cellulose: A novel functional biomaterial

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Bacterial cellulose (BC) based functional biomaterials represent an important challenge in biomaterial research for potential use in certain biomedical applications (e.g. scaffolds for bone tissue engineering). Credit goes to inherent properties of BC, such as porosity, density, water holding capacity, high strength (similar to the mechanical properties of cartilage), physical stability and relatively low degradation rate of cellulose inside the human body etc. Bone is a composite material with an organic phase (collagen and non-collagenous proteins) and an inorganic mineral phase (calcium hydroxyapatite). Moreover, it is proven that BC nanofibers can mimic collagen nanofibers for Ca-P mineral deposition via biomineralization. It is assumed that in near future, biomaterialized bacterial cellulose (filled with calcium carbonate (CaCO₃)) can be a substitute biomaterial for bone tissue engineering. Some work done on BC-hydroxyapatite (Hap) nanocomposites as similar kind of calcium deficient (Hap) found in natural bone but not much work done on BC-CaCO₃. This paper will report about promotion of CaCO₃ deposition on BC membranes using calcium chloride and sodium carbonate as starting reactants. The diffusion-driven mineralization technique has been implemented for the fabrication of CaCO₃ within BC mat. The biomimetic mineralization study was performed for 0 to 60 min at stationary conditions. Several diverse shapes and sizes dispersed white crystal cubic structures are observed on BC mat. In conclusion, it can be mentioned that incubation period has great influence on biomimetic nucleation and formation of CaCO₃. The precise information about BC biosynthesis and biomineralization process will be discussed during presentation.

Biography

Nabanita Saha has completed her PhD in 1991 in Microbial Biotechnology from Indian Institute of Technology, Kharagpur, India. After that, she worked at SPRERI as Scientific Officer. She joined at Tomas Bata University in Zlin in July 2001 and was appointed as Associate Professor in 2006. She is author or co-author of 28 papers registered in WOS database, 146 citations (without self-citations) and h-index 11. She supervised 5 Doctoral Thesis; 2 are completed and 3 ongoing [as a supervisor (3) and consultant (2)]. She is Board Member of SPE, European Medical Plastic and member of several international scientific societies.

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