

## Micropatterning of bioactive glass nanoparticles on chitosan membranes for spatial controlled biomineralization

### Authors

G. Luz<sup>1,2</sup>, L. Boesel<sup>3</sup>, A. del Campo<sup>3</sup>, J. Mano<sup>1,2</sup>

### Affiliations

<sup>1</sup> 3B's Research Group - Biomaterials, Biodegradables and Biomimetics, University of Minho, Headquarters of the European Institute of Excellence on Tissue Engineering and Regenerative Medicine, AvePark, 4806-909 Taipas, Guimarães, Portugal; <sup>2</sup> ICVS/3B's Associated Laboratory, Braga/Guimarães, Portugal; <sup>3</sup> Max Planck Institute for Polymer Research, Ackermannweg 10, 55128 Mainz, Germany;

### Abstract text

**Objectives:** Chitosan membranes were patterned with bioactive glass nanoparticles (BG-NPs) capable of bone regeneration by a Microcontact Printing technique, in order to spatially control biomineralization and also cell adhesion and proliferation.

**Methods:** After "inking" an elastomeric stamp in BG-NPs, it was pressed against the chitosan substrate and then lifted-off, in order to transfer a perfectly defined bioactive micropattern. The mineralization of the bioactive glass patterns was induced *in vitro* by soaking the samples in simulated body fluid (SBF) over several time points up to 7 days. The interaction between cells and patterned membranes surface was evaluated, by seeding L929 fibroblasts cells over 1, 3 and 7 days on their surface.

**Results and Discussion:** The induction of confined mineralization was confirmed by FTIR, EDX and SEM. Cell adhesion and proliferation were studied by means of scanning electron microscopy (SEM). The results showed that the produced patterned membranes succeeded in controlling mineralization, cell adhesion and proliferation. MTS assay confirmed that cellular viability increased with time of culture. The developed BG-NPs micropatterned chitosan membranes can be applied in *In situ* tissue regeneration.

**Conclusions:** The produced membranes proved to be a suitable substrate for cell growth, being the BG-NPs a highly reactive surface able to bond with living cells. Total control of cell attachment and spatial biomineralization was achieved through micropatterning of BG-NPs on chitosan membranes.