

## Protein-modified nanoporous ceramics for wound healing applications

D. Dutta<sup>1</sup>, J. Markhoff<sup>1</sup>, K. Rezwani<sup>2</sup>, D. Brüggemann<sup>1</sup>

<sup>1</sup> Institute for Biophysics, University of Bremen, Otto-Hahn-Allee 1, 28359 Bremen, Germany

<sup>2</sup> Advanced Ceramics, University of Bremen, Am Biologischen Garten 2, 28359 Bremen, Germany

Nanoporous anodised alumina has been a focus of interest in wound healing applications attributing to their biocompatibility, nanoscale topography, ordered porous structure to name but a few. However, these inorganic biomaterials lack the ability to provide requisite biochemical cues which becomes an absolute necessity when orchestrating multicellular tissue repair. Thereby, functionalizing them with physiologically relevant protein nanofibres gives an innovative route to the current study whereby these protein modified AAO membranes have been explored for suitable properties towards possible regenerative therapy of the largest organ in the human body - the skin.

The nanoporous AAO were silanized followed by modification with collagen and fibrinogen nanofibers employing either pH-<sup>1</sup> or salt-induced self-assembly.<sup>2-4</sup> Using pH-induced self-assembly collagen nanofibers with diameters around 150 nm were directly assembled on AAO nanopores. Salt-induced self-assembly was combined with a transfer step to modify AAO membranes with fibrinogen nanofibers in the range of 100-300 nm. Towards possible applications in wound healing we studied the interaction of the 3T3 fibroblasts and HaCaT keratinocytes with collagen-modified AAO membranes. Cell proliferations on collagen-modified AAO substrates were compared to unmodified substrates and silanized AAO via WST proliferation assay. We observed that the fibroblast and keratinocyte proliferation was slightly decreased on collagen-modified AAOs. Scanning electron microscopy and fluorescence microscopy revealed that 3T3 fibroblasts exhibited a spread morphology with a dense actin filament network, thus indicating a close interaction with the collagen-AAO composites. Keratinocytes also adhered well on the protein-modified AAO membranes, however showing a tendency to grow in cell clusters.

Our results indicate future possibilities of exploring AAO substrates with tailored protein nanofiber modifications further to better mimic the mechanobiological properties of native skin.

### References:

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