Conclusions

The results indicate that 3D scaffolds can be successfully developed starting from various Pluronic® F127 derivatives and by applying different crosslinking strategies. At present, the potential of the scaffolds developed to function as cell carriers is further evaluated (gene expression studies,…). The results will be presented at the meeting. Future work will focus on the fine-tuning of the degradation behaviour and biocompatibility as well as on the 3D Bioplotting of hydrogels containing encapsulated cells.

Acknowledgement

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GELATIN AS A VERSATILE HYDROGEL BUILDING BLOCK: ONE POLYMER, MANY APPLICATIONS

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Introduction

Mankind has always been confronted with failing tissues and organs. As a consequence, medicine has tried to offer solutions for conditions which might, in some cases, be life threatening. Throughout the years, nature-inspired biomaterials have been one of the approaches which have been deemed useful.

In our laboratories at Ghent University, we have initiated in 2006 a large research platform in which gelatin and its derivatives are screened for a large variety of biomaterial applications. In collaboration with various national and international research groups, we have been developing and studying porous gelatin or gelatin-coated scaffolds as cell carriers.

Results and discussion

Due to the solubility of gelatin at physiological conditions, a strategy has been elaborated to chemically functionalize part of the gelatin amino acids with cross-linkable groups enabling permanent cross-linking (FIGURE 1).

While the first generation scaffolds were developed using a cryogenic treatment of permanently cross-linked gelatin-methacrylamide, technological capabilities have significantly evolved. This has among other resulted in the development of perfectly interconnecting scaffolds using the Bioscaffolder technology. Starting from a scan of a part of the human body,

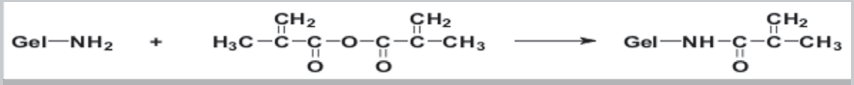

FIG. 1. Chemical modification of gelatin amine functions using methacrylic anhydride leading to a permanently cross-linkable gelatin derivative.

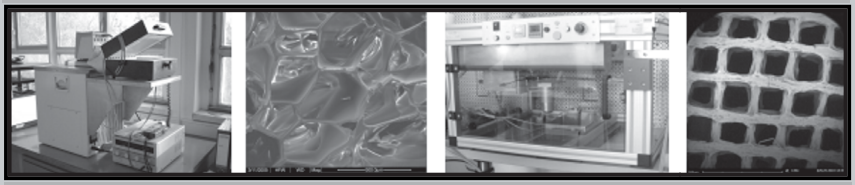

FIG. 2. From left to right: Cryogenic Unit (CU), gelatin scaffold produced using CU, Bioplotter Unit (BU), gelatin scaffold produced using BU.

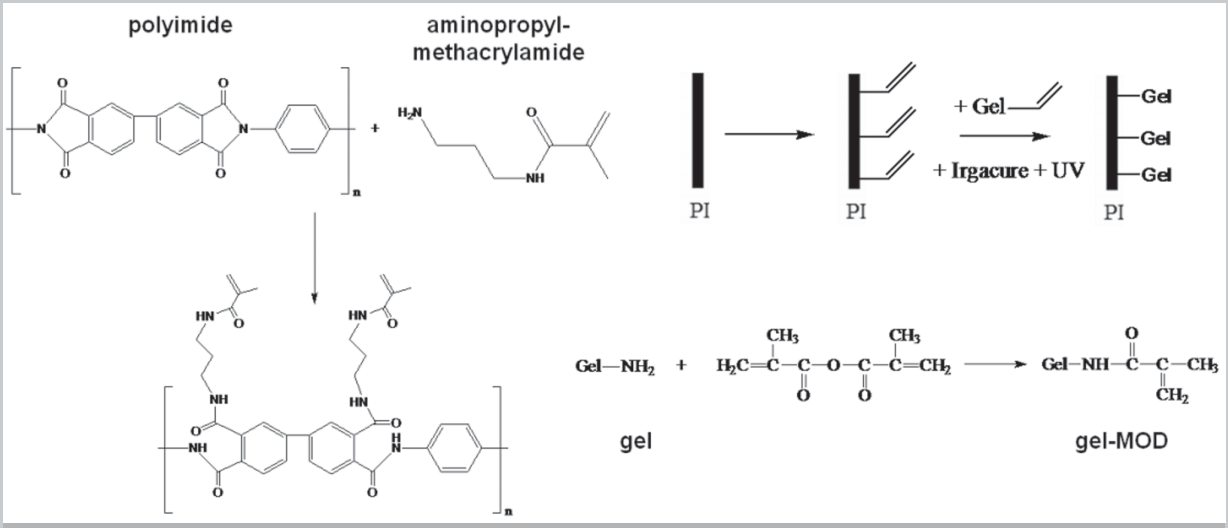

FIG. 3. Concept of gelatin coated polyimide implants for treating age related macular degeneration (ARMD).

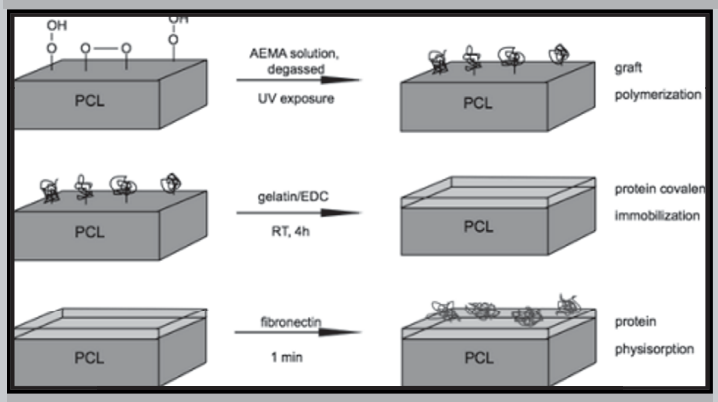

FIG. 4. Concept of immobilizing gelatin on poly-ε-caprolactone surfaces to be applied as meniscus implant.

the technology enables the production of patient specific implants. A comparison between the capabilities of both techniques is illustrated in the figure below.

In addition to applying gelatin as such, an overview will also be given of a variety of applications in which we have developed gelatin hydrogel coated implant materials. Examples range from ocular to orthopaedic applications.

In a first approach, gelatin has been covalently immobilized on polyimide implants with the aim to treat age related macular degeneration (FIGURE 3).

The latter application has enabled the development of gelatin coated meniscus (FIGURE 4) and titanium implants.

The presentation will cover for each of these applications: (1) the development of the hydrogel building blocks, (2) their processing into 3D scaffolds or implant coatings and (3) the biological evaluation of the obtained materials.

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