Cell-interactive Polyimide Membranes for Retinal Tissue Engineering Applications
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Introduction
Since the therapeutic effect of the current treatments for degenerative diseases of the macula is insufficient, the development of a treatment for these diseases is of extreme importance. In the present work, biocompatible cell-interactive polymer membranes were developed to function as retinal cell carriers.

Materials and Methods
In a first part of the work, polyimide (PI) membranes were functionalized using vinyl groups via reaction with aminopropyl-methacrylamide (MAm) (see fig. 1).

Fig. 1. Chemical structure of MAm modified PI.

The reactive groups introduced were used for the subsequent UV-initiated immobilization of MAm modified gelatine (type A or B) (see fig. 2), in this way enabling cell-interactive membranes to be developed.

Fig. 2. Immobilisation strategy of gelatin on PI.

All materials were analysed using attenuated total reflection infrared spectroscopy (ATR-IR), static contact angle measurements (SCA), atomic force microscopy (AFM) and X-ray photoelectron spectroscopy (XPS). The biological properties of the developed membranes were evaluated in a series of in vitro and in vivo tests.

Results
The results (XPS) indicate that the introduction of MAm groups on the PI was successful. XPS and AFM revealed the immobilisation of gelatin on the MAm functionalized PI membranes. The biological evaluation of the material developed proved that the gelatin coating did not affect the retinal architecture (in vitro, see fig. 3) nor the retinal function (in vivo) to a great extent.

Fig.3. Effect of gelatin-PI on in vitro retinal architecture.

Discussion and Conclusions
A strategy was elaborated to functionalize PI membranes, enabling the immobilization of bioactive molecules such as gelatin. Preliminary in vitro and in vivo studies revealed the material suitability for retinal cell seeding purposes. The strategy is now being applied for other biopolymers.

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Disclosures
The authors state that there is no commercial conflict of interest when disclosing the information in the present abstract.