Zonal Effects on Cell Growth and Proliferation by Gradient-Photopatterned Polymer Substrate

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Over the last few years biomaterials have seen a shift in focus towards the material's inductive properties apart from simply having conductive effects on cell growth and differentiation [1]. Being able to recapitulate the natural environment of the growing cells is an important parameter towards success of any biomaterial. In this study, we attempt to design a gradient-photopatterned polymer substrate that can enhance cell-substrate interactions and mediate stem cell differentiation. We used acrylated epoxidized soybean oil (AESO) as a primary component for the material fabrication. AESO in presence of a photoinitiator can be easily fabricated into thin films of polymer when irradiated by a UV source. Fig.1 illustrates photopatterned AESO sheet fabrication which used ethylene glycol dimethacrylate (EGDMA) as a cross linker resulting in better resolution of micropattern formation using a high-resolution photomask. This technique was employed to generate intricate scaffold surface patterns of various dimensions resembling a honeycomb arrangement [2]. The percentage of acrylic acid (AAC) in the constituent resin was seen to have a direct relationship with stiffness of the substrate which was confirmed through mechanical testing. This property allows us to vary the amount of the constituent elements that can enable us to set up a gradient (chemical/mechanical) along the length of the polymer. This method can be useful in achieving a zonal distinction over the polymer surface to form local niches that can support cell growth. This has been demonstrated by culturing a fibroblast cell line over individual polymer films having a particular set composition. The cell adhesion properties were observed to differ with the changing composition for each set. This work is an attempt to understand how the local environment present *in vivo* can influence cell behavior and function. Being able to mimic the natural processes *in vitro* can serve as a medium to develop more compatible and robust biomaterials in the future.

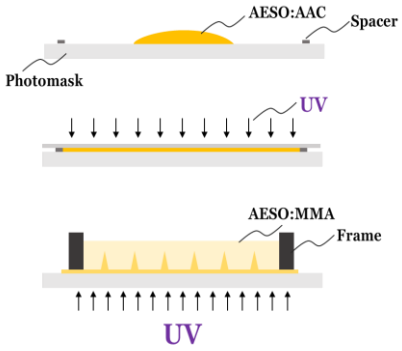

Fig.1 Schematic illustration of photopatterned AESO sheet fabrication

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[2] Pitakjakpipop H et al., Biomacromolecules, 23, 365-376 (2022)