(OP 179) Marine Polysaccharide Multilayers: PH Responsive Systems for the Surface Modification of Tissue Engineering Scaffolds

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The success of some polymeric scaffolds for Tissue Engineering is hindered by its surface chemistry, which in many cases leads to a significant foreign body response. To overcome this, the present project intend to explore a strategy of surface modification through electrostatic self-assembly, first reported in the 1990s, by the construction of multilayered systems by assembling a polycation and a polyanion in an alternate fashion.

In the present work, polyelectrolyte multilayers constituted only by marine polysaccharides are studied by Quartz Crystal Microbalance with Dissipation monitoring, QCM-D, focusing on the effect of pH in their construction, properties and stability. The results show the effectiveness of layer-by-layer assembly with the consecutive deposition steps, with the mass of each layer being dependent on the solution pH. Moreover, the effect of pH is also present after the preparation of the multilayer, once the resonance frequency of the crystal changes when it is submitted to solutions with different pHs. This was attributed to an effect on the multilayer structure due to the ionization/deionization of different groups within the macromolecules. The variation in dissipation of energy with pH supports this, once dissipation is dependent on the viscoelastic properties of those multilayers. In this way, these multilayers may constitute a pH responsive smart material.

The knowledge acquired will be later transferred to 3D substrates–porous scaffolds–with the final goal of controlling their surface properties, maintaining the mechanical properties of the original scaffolds.