

SUMMARY

Hyaluronic acid, HA, and poly (ethyl acrylate), PEA, are two polymers widely used in biomedical applications, especially in tissue engineering, because of their excellent biocompatible and bioactive properties. HA is a highly hydrophilic biopolymer and the PEA, on the other hand, is hydrophobic. In addition, each one of them has certain shortcomings that limit the potential of its application, so that being able to combine them in a viable way in one biomaterial is of great interest and in turn is a very promising and attractive challenge for the development of new biomaterials.

In this thesis, using formic acid, FA, as the common solvent, HA-PEA combined systems were developed, making both polymeric phases compatible in their non-crosslinked state. Previously, the effect of formic acid on HA and PEA was evaluated, and no possible chemical modifications, significant degradation nor cytotoxicity appearance were detected by means of techniques of physical-chemical and biological characterization. Thus, various HA-bl-PEA combined systems with different composition, geometry and architecture were manufactured as two-dimensional films, electrospun membranes and three-dimensional porous scaffolds, using solvent casting, electrospinning and freeze-extraction techniques. The physical-chemical properties of fabricated systems reveal a certain mutual reinforcement produced by both phases, and the biological characterization highlights the potential of the studied systems as biomaterials.

In order to increase the degree of compatibility between HA and PEA and the overall stability of combined systems, it was decided to use, instead of homopolymer PEA, a copolymer based on ethyl acrylate, EA, and another acrylic monomer which should be more reactive and have functionalizable chemical groups (hydroxyl or carboxyl). For this purpose, both cross-linked and non-crosslinked P(EA-co-CEA) copolymer systems with different content of 2-carboxy ethyl acrylate, CEA, were developed. Being novel materials, they were subjected to a complete physical-chemical and biological characterization, confirming their aptitude as biomaterials. Subsequently, was studied the possibility of producing combined systems based on these copolymers and hyaluronic acid, which would possess better properties than those already achieved in HA-PEA systems.