NANOMETRIC STRUCTURES BY SELF-ASSEMBLING FROM RECOMBINANT PROTEIN ELASTIN-LIKE POLYMERS

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Today, the connection between biomaterials science and nanotechnology has made possible the design of new advanced materials based in natural systems. The elastin-like polymers (ELPs)[1] are a new family of protein polymers obtained by recombinant DNA technologies. They are based on the recurrence of certain short peptides that are present in the natural elastin protein. This polymer family shows extraordinary features: biocompatibility, biodegradability, mechanical properties similar to those of the natural elastin, acute "smart" nature and self-assembly behaviour. The specific composition of these polymers defines their main feature called Inverse Temperature Transition (ITT) that occurs in aqueous medium and in which can be regulated by the pH, temperature, salt's concentration…

In this study the design of different amphiphilic ELPs allows to obtain spontaneous nanometric 3D structures by variation of pH and temperature in aqueous systems, such as micelles and nanovesicles [Figure 1]. Those self-assembled structures are highly relevant for the use of these polymers in advanced biomedical applications, such as tissue engineering and controlled drug release. For example the spontaneous formation of stable, nano- and microparticles by poly (VPAVG) as vehicles for the controlled release of the model drug dexamethasone phosphate (DMP) have been reported [2]. Additionally, it is possible to obtain in this manner 2D structures, such as polymer sheets showing self-assembled nanopores [3], with the hydrophobic surrounding of the charged domains.

In other hand, ELPs can be used to prepare other interesting structures. The *electrospinning* technique has been used for the preparation of polymer substrates and matrixes. By this, it can be obtained continuous fibres with nanometric dimensions and high surface/volume ratio from ELPs that can incorporate bioactive sequences such as cell attachment peptide sequences of REDV or RGD for tissue engineering [Figure 2].

References;

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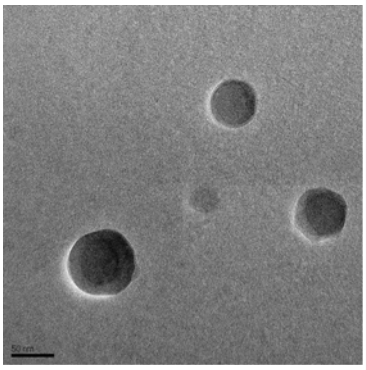
Figures



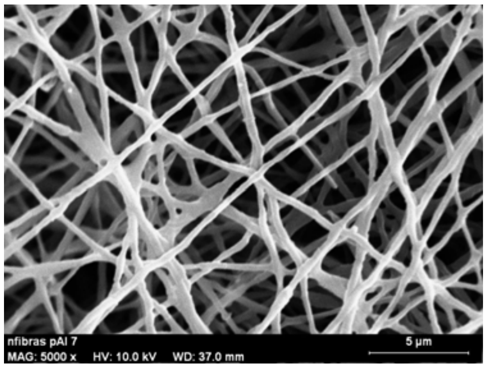


Figure 1

Figure 2

Figure 1: TEM micrograph of diblock copolymer E10A60 at 50ºC. Figure 2: SEM micrograph of substrate obtained with *electrospinning*.