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Design and Characterization of Polymeric Blends for Biomedical Applications

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In biomedical applications, it should be useful to have a system easy to administrate (the best would be a liquid injectable form), with structural properties in physiological conditions (the best would be a soft gel), able to resist to external stimulus (such us the erosion from body fluids, in this case the surface should be a hard gel). Such a system could be used as a drug delivery system, as well as a temporary scaffold.
From previous investigation, we found out that the acqueous solution of Pluronic F127 and alginate (18% F127 + 2% alginate), is liquid at low temperature (around 5°C), it gives a soft gel due to the Pluronic thermogelation at body temperature (around 37°C), and it gives a hard gel after the exposition at solutions of bivalent cations (reticulation, using Ca^{2+}, Cu^{2+}).
Prior of any other application, the system has to be thouroughly characterized. Therefore, 1) the mechanical properties of the solution were investigated by using rotational rheometry (monitoring the increase of solution moduli during heating); 2) the compressive behavior was investigated with impermeable and porous parallel plates (underlining the rule of the water to build up the properties of the gel); 3) the kinetics of cuprum diffusion and of hard gel formation were quantified (obtaining the thickness of reticulated layer – see the Figure – as function of cuprum solution concentrations and of exposure time. In the Figure, the symbols are experimental data and the surface curve is the model prediction). Further investigations are still ongoing. The data gatered will be used for the proper design of future biomedical applications.