PVP hydrogels obtained by gamma radiation. Advantages of the technique

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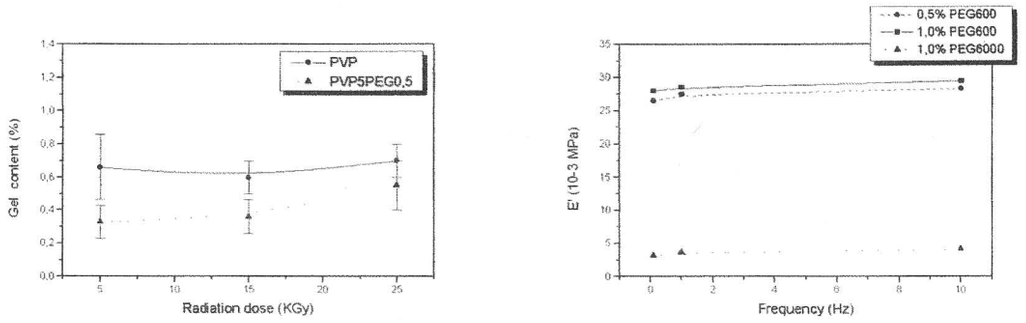
The use of hydrogels as biomaterials has increased lately. Since 60's when Witcherle studied poly(2 hydroxy ethyl methacrylate) (PHEMA) hydrogels for using in ophthalmology, the application of these materials have spread in different areas of medicine and dentistry. Poly(vinyl pirrolidone) (PVP) is an example of polymer applied for the synthesis of hydrogel to be used in different biomedical applications [1-2]. The knowledge of the chemistry of PVP radiation allow the use of this technique for obtaining PVP hydrogels with physical and chemical characteristics required by different uses.

This paper describes a study on poly(vinyl pirrolidone) (PVP) hydrogels obtained by ionizing radiation techniques for using as biomaterial. Samples of PVP hydrogels were obtained from gamma radiation (Co^{60}) of PVP water solutions in different concentrations by using different dose rates (5 - 25 KGy) in the presence of different additives. Depending on the synthesis parameters used it was obtained samples of solid hydrogels or fluid gels with different shear storage modulus (G'). Gel samples were characterized by measuring its gel content and rheological characteristics by DMA. Additionally, it was verified the sterility and cell cytotoxity of hydrogels.

Gamma radiation of PVP solutions resulted in different gel content and consequently different rheological properties of the material (figures 1a and 1b). Besides this, the resultant gels are sterile and non-toxic (figure 2).

It was concluded that the radiation technique shows advantages for PVP hydrogels synthesis since allow an easy control of the hydrogel characteristics by choosing an adequate combination of the starting solution formulation and radiation dose rate in view to obtain an hydrogel with the behavior required for different situations such as wound dressing or soft tissue replacement / repair. Additionally the technique allows performing the hydrogel synthesis and sterilization in a same step in lab or industrial scale.



(a) (b)

Figure 1 - Influence of some synthesis parameters on gel characteristics: (a) radiation dose X gel content and (b) additive used in PVP water solution X storage modulus of gels.

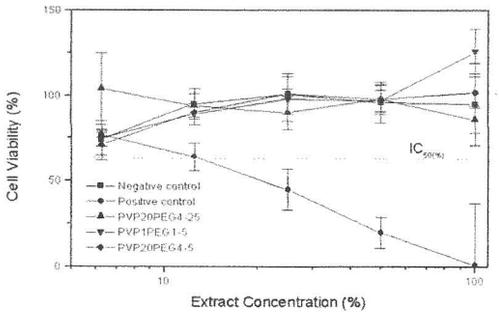


Figure 2: Cell viability (%) using NR cytotoxicity assay with L929 cell culture for different hydrogels samples.

References

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[2] Lugão et al, Radiat. Phys. Chem.,56(1-6), 319 (1998).

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