ELECTROSPUN FIBERS AND MICROSPHERES OF POLYVINYLPYRROLIDONE CONTAINING BIOACTIVE COPPER DERIVATIVE BY ELECTROSPINNING

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SUMMARY

Electrospinning is a versatile technology capable of producing fibers, spheres, and beads with micro or nanometric diameters due to the electrostatic forces applied on a fluid (i.e., normally polymer solution). This last, is produced by the electrospraying method, which is derived from electrospinning technology, that also occurs by electrostatic forces [1]. Polyvinylpyrrolidone (PVP) is a biodegradable, biocompatible, nontoxic polymer, and is widely used in the biomedical area. Besides, it has potential

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application in novel technologies against coronavirus disease 2019 (COVID-19), such as production of nasal sprays and in situ gel for drug release [2]. Recently, a study showed the copper sulfate as an interesting antiviral [3]. In this context, we explored the $CuSO_4$ – a copper derivative, for incorporation in microspheres and fibers of PVP using the electrospinning technology with possibility future test against Sars-CoV-2. The copper sulfate ($CuSO_4$)–loaded polyvinylpyrrolidone (PVP) fibers and microspheres were successfully produced by electrospinning. PVP/$CuSO_4$ solutions with different concentrations were tested, such as 20, 13.3, 10, and 6.6%(w/v) of PVP with 3, 1.0, 0.6, and 0.2 % (w/v) of $CuSO_4$, respectively. We observed change in the electrical conductivity and rheological behavior of the different solutions, which contributed to the formation of the microspheres. IR spectra showed a chemical interaction of the Cu^{2+} ions with oxygen in the PVP resonant ring. SEM images revealed the morphology of the $CuSO_4$-PVP fibers and microspheres that exhibited diameters of 0.80 ± 0.35 µm and 1.70 ± 0.50 µm, respectively. EDS mapping showed the presence of copper in the electrospun fibers and microspheres manufactured. In conclusion, the decrease of the viscosity and the application of a high shear rate are the key to inducing the formation of $CuSO_4$–loaded PVP microspheres, showing the electrospinning versatility.

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