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Electrical Conductivity as a Control Factor in Selected Processes of Polymerization and Application of Micro and Nanoparticles

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Extended Abstract

Electrical conductivity is an important factor in the analysis of colloidal solutions often proposed as innovative systems for controlled drug delivery. Basic measurements of electrical conductivity include specific, molar and limiting conductivity, in the context of the conductivity of individual ions, and solvent and solution properties such as viscosity and density. Zeta potential measurements of colloidal systems are carried out as a factors informing about the potential stability of nanoparticle and microparticle dispersions [1]. Many of them, in pharmaceutical practice and medical analysis, are systems of aqueous dispersions of hydrophilic polymers in water. It seems that the course of polymer synthesis processes and the assessment of the ability of polymer systems to release medicinal substances can be monitored using conductometric measurements. Although the measurement result is necessarily the result of the movement of the ion mixture, in many cases, using appropriate standard systems or conducting studies in specific systems, the electrical signal can be used as information allowing to obtain useful knowledge about important features of the system being studied. A good example is the measurement of electrical conductivity, which can reflect changes in the concentration of a drug released from a drug dosage form, as exemplified by studies of the release of iron salts from complex drug forms [2,3]. Some attempts were made to apply the conductivity assays in evaluation of polymeric and liposomal preparation for topical and transdermal drug delivery [4,5]. Concentrations of other components within the nanostructured or microstructured may be reflected in the conductivity studies of. In studies on the synthesis of thermosensitive polymers with potential medical and pharmaceutical applications, we have repeatedly used the measurement of electrical conductivity of polymer microspheres and nanospheres obtained in the course of free radical synthesis. An interesting aspect is the comparison of the synthesized macromolecules, formed into nanostructures or microstructures, in terms of the conductivity of their solutions, which allows drawing conclusions about contamination with unreacted substrates or the presence of ionic functional groups [6,7]. In addition, the results allow, for example, estimating the end point of free radical polymerization, by identifying the asymptote on the conductivity-time graph, and indicate structural changes in the dispersions of thermosensitive polymers, along with changes in temperature and time [8,9].

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