

Abstract

Nanoparticles have attracted special attention in recent years due to their unique physical, chemical, and biological properties, which arise from their small size and high surface area-to-volume ratio. These properties make nanoparticles important elements in many fields, ranging from medicine to electronics. This master's thesis aims to study in detail the thermodynamic properties of the drug farnesol encapsulated in drug-carrying polylysine nanoparticles. Calorimetric and spectrophotometric methods were used in the research process, which allowed us to determine the stability of nanoparticles and their structural changes in the presence of farnesol.

The experimental part includes the analysis of polylysine nanoparticles incorporated with the drug farnesol at different concentrations and in the presence of solvents (methanol, deionized water) under two different preparation methods (emulsion and nanoprecipitation).

According to the results obtained, the thermodynamic and optical properties of nanoparticles significantly depend on their preparation method, concentration, and type of solvent. As a result of calorimetric analysis, it was determined that nanoparticles prepared by the emulsion method are characterized by higher thermal stability and higher temperatures of second-order phase transitions than samples obtained by the nanoprecipitation method.

Spectrophotometric studies revealed that nanoparticles are characterized by light scattering in the wavelength range of 300-500 nm according to Rayleigh's law, which confirms the presence of nano-sized structures. The phase transition temperatures and optical properties of nanoparticles change significantly with increasing farnesol concentration, which indicates the role of farnesol in modifying the structure of nanoparticles.

The study findings show that farnesol-polylysine nanoparticles have properties that allow them to be used for medical purposes, in particular as drug delivery systems. The data obtained will be important for improving the stability and efficacy of nanoparticles in biomedicine.