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Viscosity–Temperature Relationship of Dextrin–Riboflavin Solutions for Biological Applications

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Extended Abstract

Considering the biomaterial science, property of biocompatibility of materials takes an important role for health of humankind in recent days. Biomaterial or biocompatible material is synthetic or natural material used in medical treatment or replaces any part of biological organism. Biocompatible materials must be adapted by the body like its own tissue and also must correspond to a body's physical, chemical and mechanical properties. Polymers can be used as materials that deliver drugs or renew cells. As it is seen in our earlier study of gelatin-based RF solution, Dextrin (D) and riboflavin (RF) solutions have major impact on medical field such as drug delivery or injuring pad [1].

In this research, 10% D and 0.1% RF solutions were chosen due to these percentages are used in medical field generally. In consideration of that, 10% D solution with 0.1% RF content is blended at 50°C at 1200 rpm for about 30 minutes after preparation of D and RF solutions separately (10D01RF). According to the UV absorbing property of RF content, the solution is preserved from sunlight during the preparation. Primarily, the spectroscopic investigation of 10D01RF solution was held in to be obtained the absorption wavelength and emission wavelength which was attained from the absorption spectroscopy. Thereby, the proper wavelength for the exposure of the solution was determined considering medical application of the sample. By performing the rheological investigations of pure 10% D solution (10D), D with RF solution preserved from sunlight (10D01RF-B), and D with RF solution exposed to the light that has the same wavelength obtained from spectroscopic investment (10D01RF-A) at the room temperature, fluid types and mathematical models of all solutions were established from hysteresis curves of each solution separately. Besides, at specific speed values of solutions, which were obtained from each of hysteresis measurements, viscosity values were attained with changing temperature from 18°C to 45°C. As a result of these measurements, viscosity–temperature graphs were plotted and mathematically modelled for each solution.

It was investigated from the study that 10D, 10D01RF-B and 10D01RF-A solutions have dilatant fluid type and their viscosity behaviour with changing temperature were adapted by Arrhenius model. pH values of these solutions showed parallelism with the viscosity alterations. The viscosity value of 10D solution was decreasing with the additional 01RF. On the other hand, UV exposure did not change the fluid type, but caused to increase of dynamic viscosity. According to the Arrhenius model, it was found that all specimens have positive activation energies.

References

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