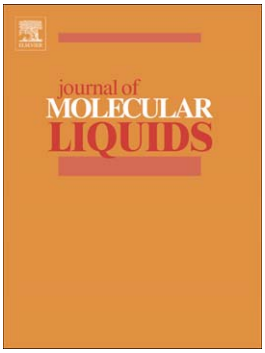

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Thermal and UV Radiation Effects on Dynamic Viscosity of Gelatin-Based Riboflavin Solutions

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ABSTRACT

Two samples of gelatin based solutions which consist of 2% of biocompatible gelatin content and 0.5% of UV sensitive riboflavin sample were constituted at the room temperature. During the preparation process, the solutions were protected from the light since the UV sensitive riboflavin content acts as an onset initiator agent of photo-crosslinking reaction in case of light radiation. To clarify the effect of UV radiation on viscosity of specimens at different temperature range, one of the prepared specimens were radiated to UV for a while at the wavelength value where the biologically suitable one of the peaks is determined in UV/visible absorbance. Afterwards, the viscosity measurements of UV radiated and un-radiated gelatin based riboflavin solutions were performed with the speed value where the most reliable torque value is shown, at different temperature values. Experimentally, it was understood that there was no change in fluid types as a result of UV radiation, however; viscosity values of both solutions diminished at the elevated temperature levels. The viscosity of pure gelatin content was lower than gelatin-RF content and addition of RF increased the viscosity. All samples were mathematically modeled by Boltzmann equation as each specimen obeyed Arrhenius model.

Key words: biocompatible materials, UV sensitivity, Newtonian fluids, Arrhenius model, shear thickening, dilatant fluids

1. INTRODUCTION

The use of biocompatible materials, particularly biopolymers which can be obtained from natural resources, are the new trend for diverse applications including the fields of drug delivery systems, tissue engineering and medicine since these materials can be integrated to biological systems of living beings [1-3]. Biopolymers are as long as being biocompatible which means biodegradable, adaptive and no toxic influence on living cells and medium, these materials can be implemented in many ways in the form of films, liquids or gels. At this point, gelatin which can extensively be used either in gel phase or film form, can be given as one of the beneficial biopolymers. Gelatin is a natural biopolymer that can easily dissolve in water, and it can be obtained from skin, bones and collagen of animals via the hydrolysis or the reaction of thermal denaturation [4-5]. Gelatin can be extracted from different animals like fish, porcine and so forth. From food industry to encapsulation of the pharmaceuticals, the usage area of gelatin extends [6-8]. Besides of industrial applications of gelatin, the medical implementations have been taken a significant place as it brings about tremendous benefits to mankind. Basically, gelatin sponges act as tampauning influence when it is used whereon wounds [1]. As protein-like gelatin is a natural chemical cross-linker, the cross-linked bonds of gelatin molecules can trap the target pharmaceuticals in drug delivery systems [9]. In tissue engineering, gelatin is a beneficial resource to be used as scaffolds since it possesses a great regenerative impact on tendons,