

ULTRASONICALLY-INDUCED BIREFRINGENCE OF DEXAMETHAZONE DISODIUM PHOSPHATE SOLUTIONS

C. Kouderis¹, P. Siafarika¹, A. G. Kalampounias^{1,2,*}

¹Department of Chemistry, University of Ioannina, Ioannina, GR-45110, Greece

²Institute of Chemical Engineering Sciences, FORTH/ICE-HT, Patras, GR-26504, Greece

(*akalamp@cc.uoi.gr)

ABSTRACT

Betamethasone, dexamethasone (see Figure 1 for the chemical structures), and their ester derivatives are synthetic glucocorticoids used as anti-inflammatory or immunosuppressive agents, and are used in treatment of allergies, arthritis, asthma, etc. The beta- and dexamethasone forms of these molecules are epimers with identical chemical structures except that the orientation of the methyl group at the C-16 position is in the opposite direction from the plane. Despite minor spatial differences in structures, different isomeric forms of an active pharmaceutical ingredient (API) may have vastly different physiological effects. One isomer can be beneficial, while the other isomer might be toxic to human beings.

Ultrasonically induced birefringence has been observed in various liquids and solutions^[1]. For the small anisotropic molecules, the velocity gradient caused by ultrasound can directly induce the sinusoidal orientation. This causes the sinusoidal birefringence, which is proportional to the square root of the ultrasonic intensity (WU)^{1/2}^[2]. For large anisotropic particles, the orientational motion cannot follow the sinusoidal velocity gradient. However, the radiation pressure, which is one of the typical quadratic acoustic effects, produces the stationary torque on the particle that induces the uniform and stationary orientation of the particles in the solutions^[1,2]. In this case, the induced birefringence is proportional to the ultrasonic intensity WU. The 'non-biased' detection technique was utilized for the ultrasonically induced birefringence measurements, which allows the detection of both the sinusoidal and stationary birefringence. If both the sinusoidal and stationary birefringence co-exists, the predominant birefringence will be observed. In this study, we performed concentration and temperature dependent measurements of ultrasonically induced birefringence. We obtained the intrinsic values of the stationary and transient birefringence for several dexamethasone disodium phosphate solutions and related those to the segmental anisotropy in polarizability. The results indicated that the induced birefringence is proportional to the ultrasonic intensity. We also measured the frequency dependence of the stationary birefringence to progress on the comprehensive understanding of the mechanism of the ultrasonically induced birefringence phenomenology in these glucocorticoid solutions.

Θεματικές ενότητες:

Φυσικοχημεία – Θερμοδυναμική

Βασική και Εφαρμοσμένη Χημεία

Προτεινόμενος τρόπος παρουσίασης: poster

LITERATURE

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