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Effect of polysiloxane Liquid Crystal Polymer on tin Oxide(SnO_2) Nanoparticles Properties for Humidity and Climate Components Sensors

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Abstract:
In the conjugation between atmosphere, land and hydrometeorology, one of the primary concerns is how the environment and climate depend on the interaction between precipitation, soil and plant moisture, clouds and irradiation (Rn). Throughout the hot season, the Earth's surface temperature is determined by large-scale synoptic processes, the atmosphere boundary layer (BL), storms, and precipitation. To study all climate and humidity properties, various devices in which liquid crystals are used . In this study, the properties of liquid crystals are studied and improved. and using nanomaterials for better, faster and accurate results.
The effect of sno_2 nanoparticles on the properties of electro-optical polysiloxane crystals used in humidity and climate measuring devices has been studied. Five different ratios of nanoparticles were added to the liquid molecular weight of liquid crystal siloxin. We note that the viscosity of the polymer will affect the properties of the liquid crystal, and the glass transfer temperature will decrease due to the added nanoparticles. As a result of the theoretical threshold voltage effort, the effect of sno_2 nanoparticles on voltage and response times has been studied.

Key words: sno_2 nanoparticles, polymer polysiloxane , electro – optic response

1. Introduction

A technique focused on anesthetic networks of liquid crystals to generate mechanical self-contained movements in plastic films under constant light radiation. Photos-the anticipation of dopants, which will dissipate in heat at the speed of light, paired with comparison thermal expansion and self-shading of films And lead to deformation which is self-contained. The dimensions and coefficients of the image, path and intensity of light are influenced by oscillations and observed. System offers the development of applications in power conversion and soft harvesting-robots and automated systems. The general approach mentioned here is to build liquid crystalline films by themselves, and to explain the mechanical and thermal effects observed. The mechanical and thermal vibrations obtained on irradiation are monitored with a high-speed camera. The results are quantified using an image-processing program to analyze the images[1].

The past of liquid crystal began in the 20th century In 1888 the world

revealed to Frédéric Rinzer that benzoy cholesterol merged at a temperatu re of 145.5 ° C[2].

The fluid formed between solids and liquid (unclear) was described as a f ourth case of matter by the German physicist Ituilmann, added to the kno wn solid, liquid , and gaseous states. This was termed a situation[3].

In order for the material to be a liquid crystalline, the molecules must be of different properties in the crystalline form, and the physical properties of the liquid crystal must be distinct[4]. The properties of liquid crystals vary from the properties of solids and liquids; The liquid crystals are: refraction, elasticity, conductivity, viscosity and refractive index. [5].

It is the arrangement of liquid crystal molecules which determines the crystal. Three forms of crystalline phases exist: smectic, nematic, and colystolic. [6,7] For liquid crystals, the condition is necessary, it is the anisotropic properties. And the properties are anisotropic, such as refractive index, electrical conductivity, viscosity and elasticity. The external sphere (magnetic, electrical, optical, thermal and mechanical) can be used to effect changes in the liquid crystals' electro-optical properties. Recently, attention has been given to the interconnection between optical and electrical properties of liquid crystal phases and to obtaining new optical devices[8,9].

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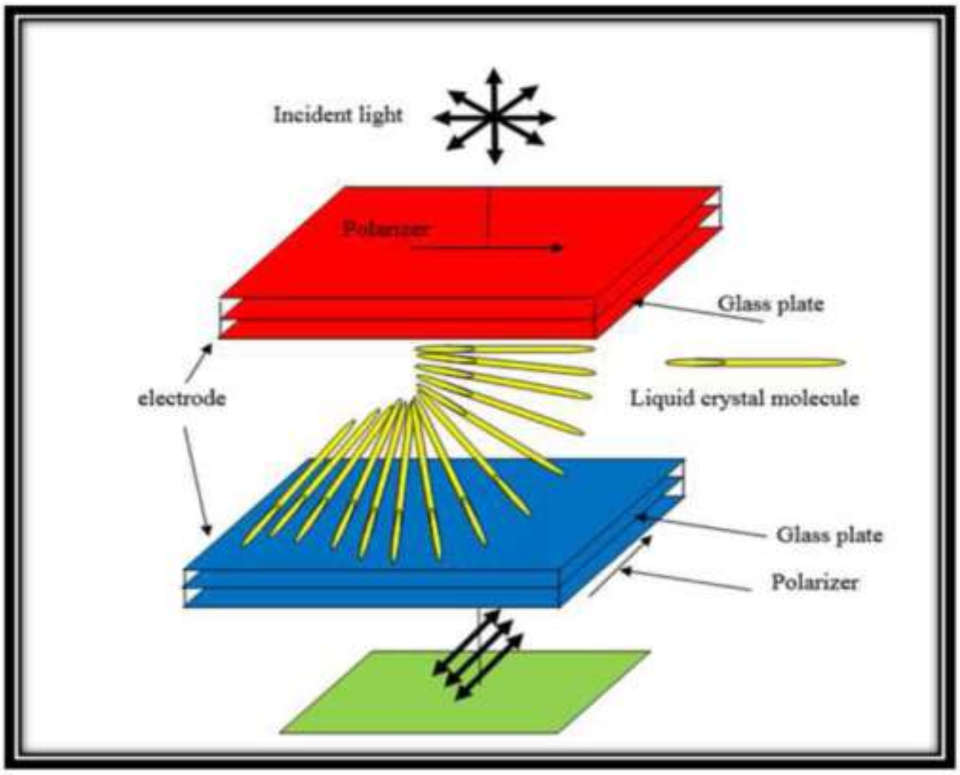
2. Practical part

In this study, a conductive material (tin oxide) examines, cleanses and dyes the electrophoresis properties of the selected glass, and then slices are cut. After washing the glass with water, placed in the ultrasonic device for 30 minutes, then placed in a heat oven for 30 minutes and 80 degrees, then placed on the polymer and 10-15 minutes after heating, then placed the second glaze

The working system consists of a laser source (He-Ne) with a wavelength of 632 nm and a capacity of 0.95 mW. It is also polarized to determine the direction of the laser light and also a heating chamber where the model temperature is controlled and the analyzer is oriented vertically on the polarizer and the photovoltaic cell, after the analyzer, which calculates the intensity of the passing radius, Is also positioned as an electrical source (oscillator) to generate the sine wave and amplify the amplifier wave[9].



Figure(1). illustrates the working system used

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The principal photovoltaic properties measuring devices:

HCS302, ALCT, and MK1000

It is used for measuring the times of visual response.

The cell is positioned within the heating chamber to test the voltages where we get a maximum path called high voltage, following which the polarized laser is positioned on the cell that is perpendicular to the liquid crystalline molecules' longitudinal axes. Then goes through an analyser in the heating chamber to pass through the greatest amount of laser radiation. Following this the optical cell measures the mass. Then we'll get different voltage levels, where the higher the voltages the

lower the strength, before we get maximum feedback from the liquid crys talline molecules. For all models using this approach is replicated as

each model includes a particular proportion of nanoparticles (SnO_2).

The opening time is calculated as the time between the highest intensity and the lowest intensity, and the voltage at which the liquid crystal molecules are calculated with complete guidance. This also measures the return of the laser beam before the voltages to its first condition and is the closure time[10,11].

3. Results and Discussion

This measured the electro physical properties of each cell Five different nanoparticles ratios (SnO_2) are added to the liquid crystals and we obtain patterns (p1, p2,p3,p4,p5), increasing the conductivity of the liquid crystal when applied to the electrical field, improving the viability of the molecules of the system and improving the electro-optical properties of the system.

The effects are obtained in numbers ((2),(3),(4),(5) and (6) by applying various percentages of nanoparticles (SnO_2) to a liquid crystal at a temperature below the T_{NI} and a constant frequency voltage (500 Hz).

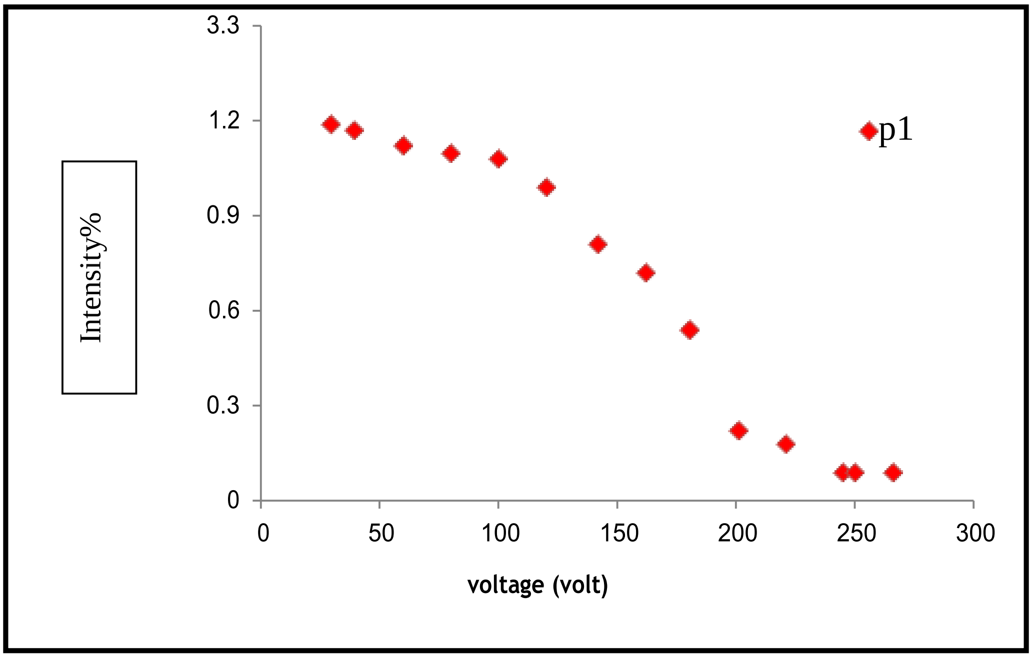


Figure. (2): Variation of the normalized intensity for addition P1

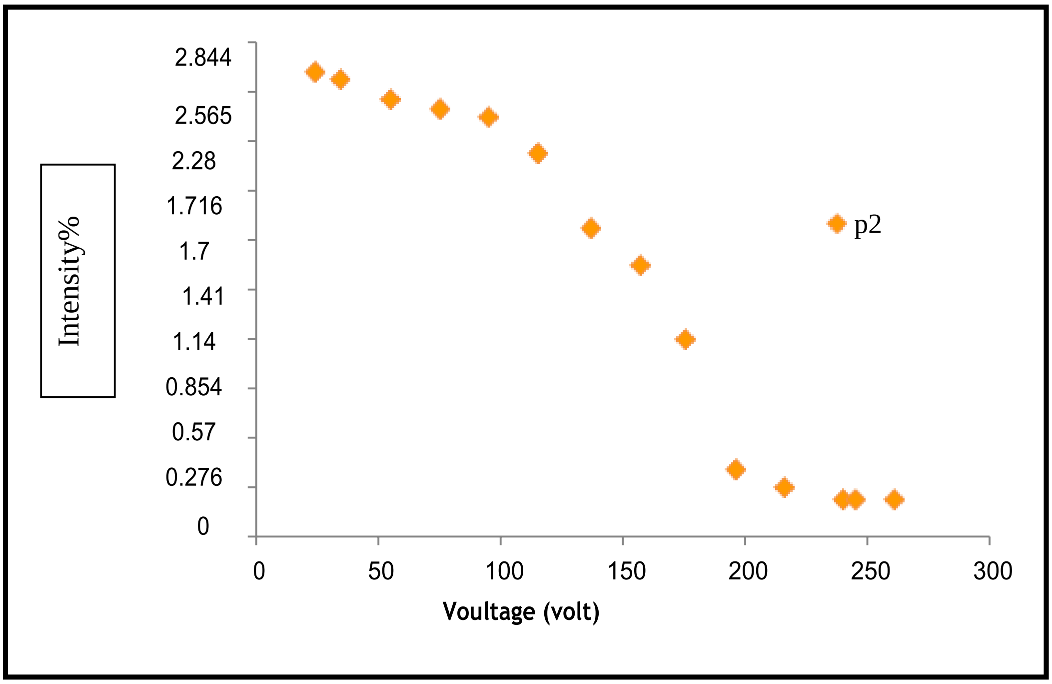


Figure. (3): Variation of the normalized intensity for addition P2

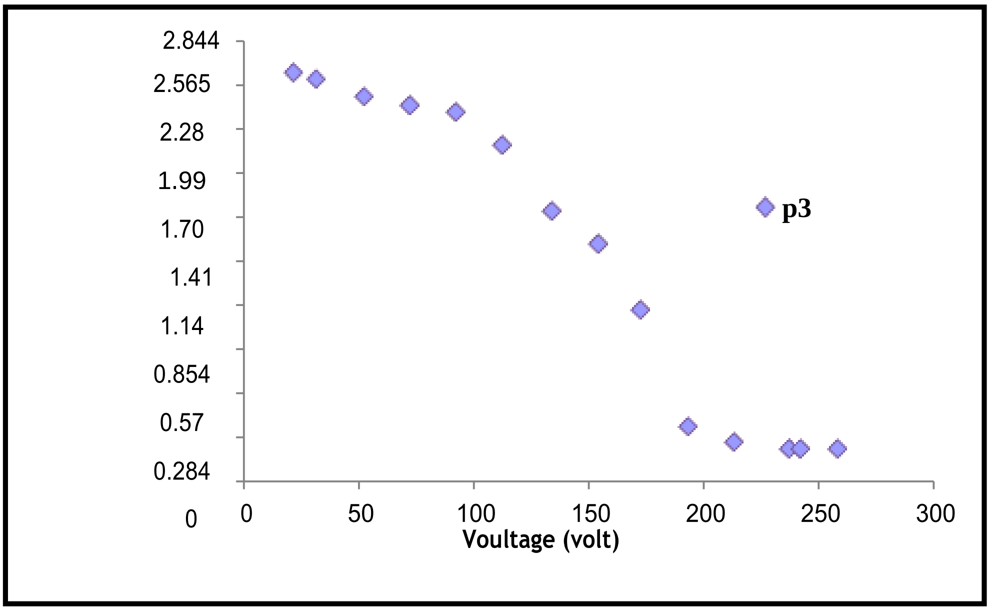


Figure (4): Variation of the normalized intensity for addition P 3.

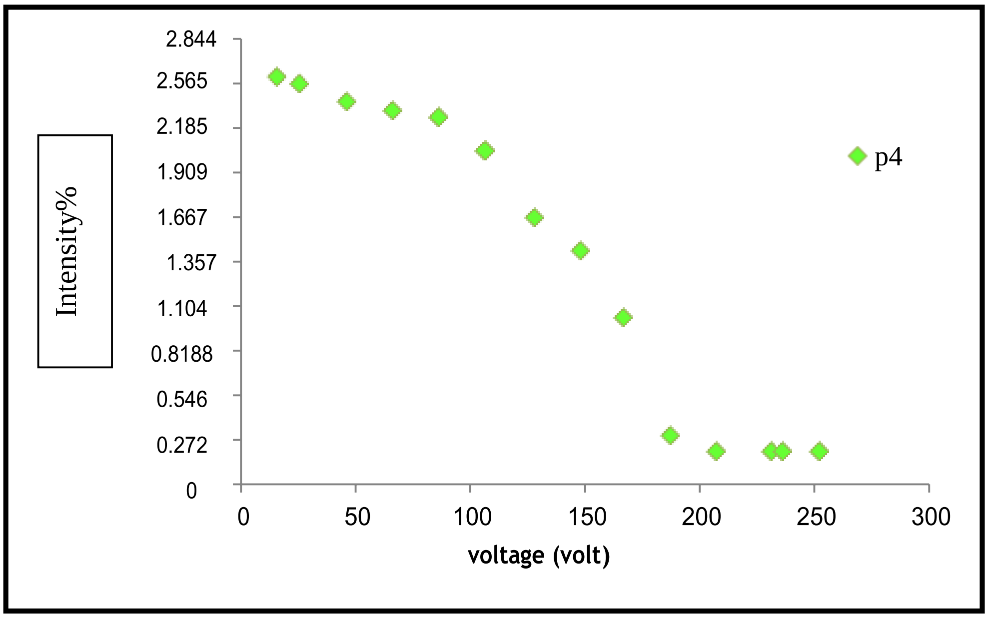


Figure (5): Variation of the normalized intensity for addition P 4.

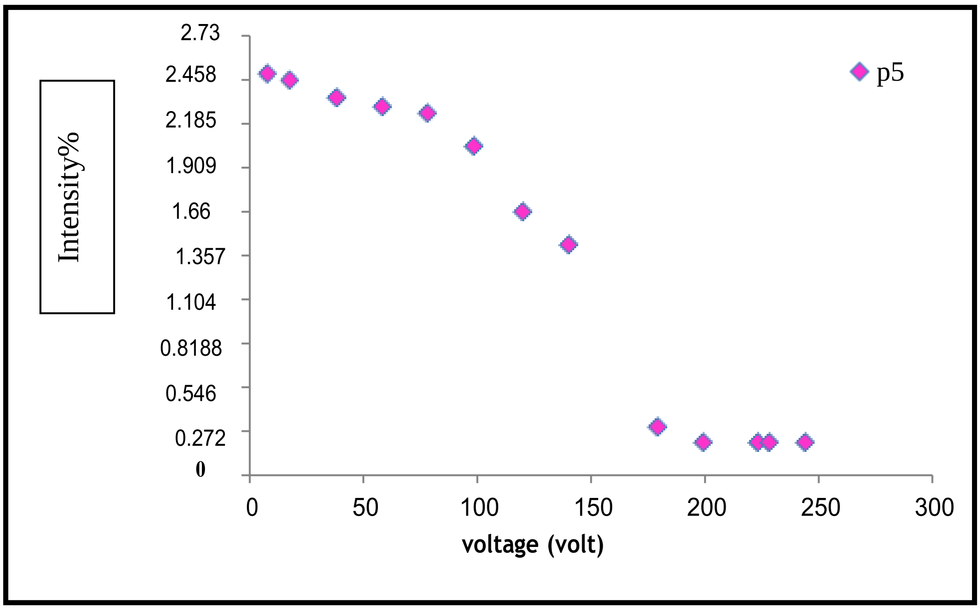


Figure (6): Variation of the normalized intensity for addition P 5.

Thus we get complete routing voltage (operating voltage) and threshold voltage per cell as well. Note that the higher the proportion of nanoparticles added, the greater the intensity and density, the dipole group and the properties of the insulation, the lower the threshold voltage and the voltage of operation. As in figures(7)and(8).

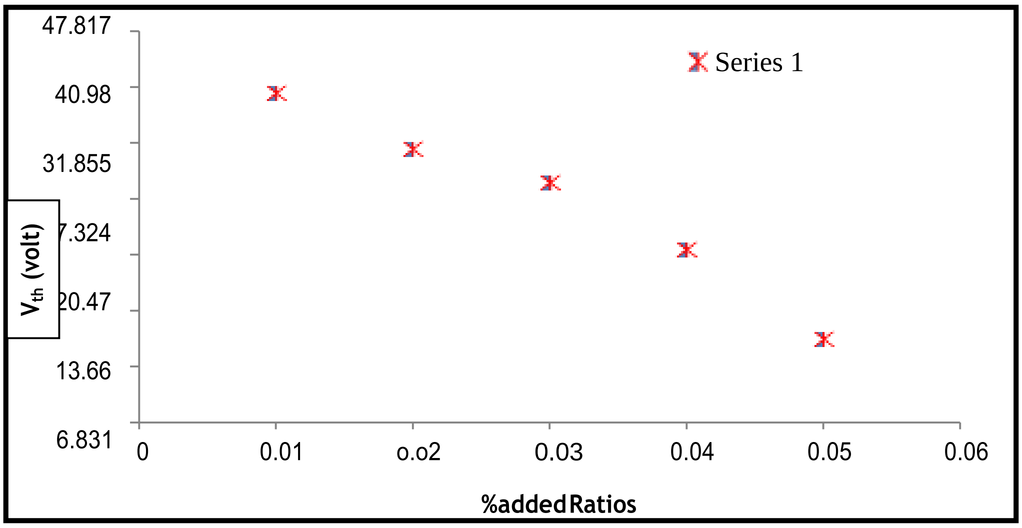


Figure (7): shows the relationship of the threshold voltage is added with the five used in this study ratios

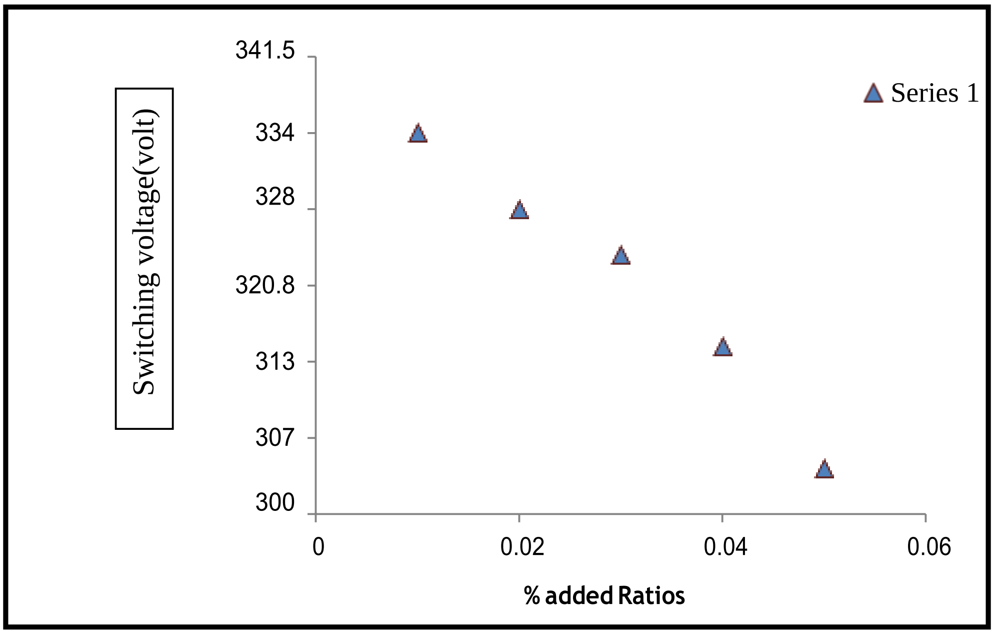
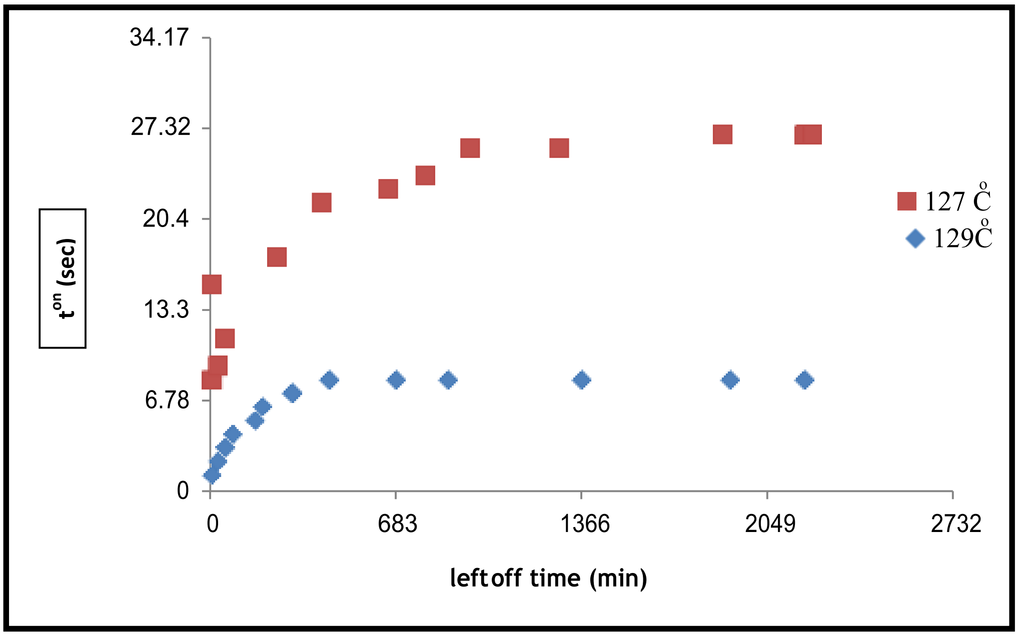


Fig (8): shows the operating voltage as a function of rates SnO_2 added to the polymer

The added nanoparticles (SnO_2) minimize the degree of kiure propagation, thus decreasing the visual reaction times, evaluating voltages for the full direction, adding them to the cell, and the time needed for the full direction to occur. Figure (9-13) shows run-time operation as a function of turning off the field before measuring out.

The methodology allows for the measurement of both t^{on} and t^{off} using the framework and method defined in the work. We usually added (143 to 240) volts (peak to peak) at a frequency of 500 Hz to achieve full switching. Variable strength of light transmitted in this work, depending on the voltage applied and the voltage needed for each polymer



Figure(9): Switching-on (τ^{on}) and time left off (τ^{off}) for addition P 1

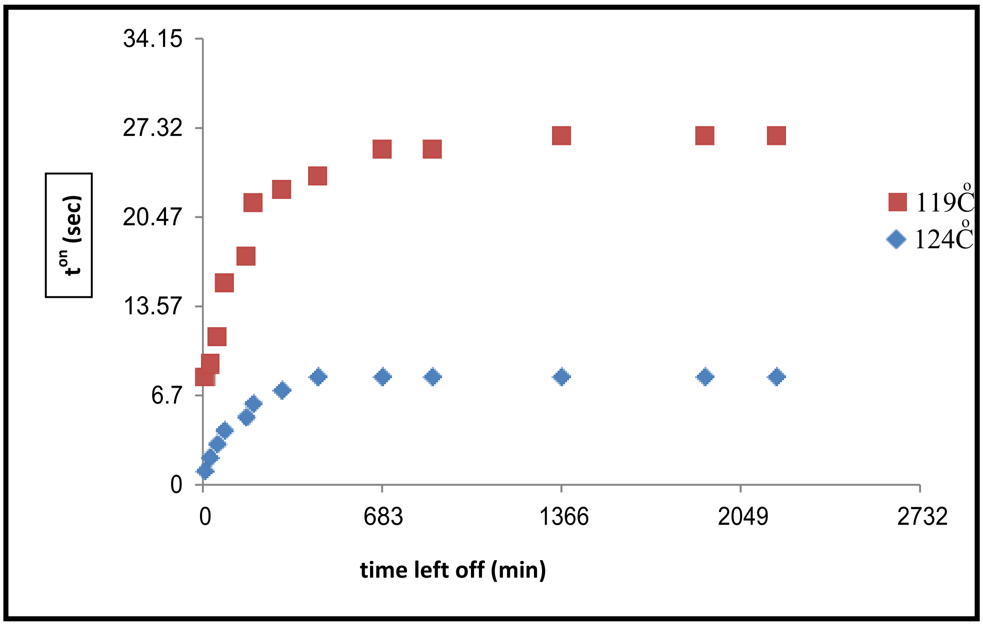


Figure (10): Switching-on (τ^{on}) and time left off (τ^{off}) for addition P 2

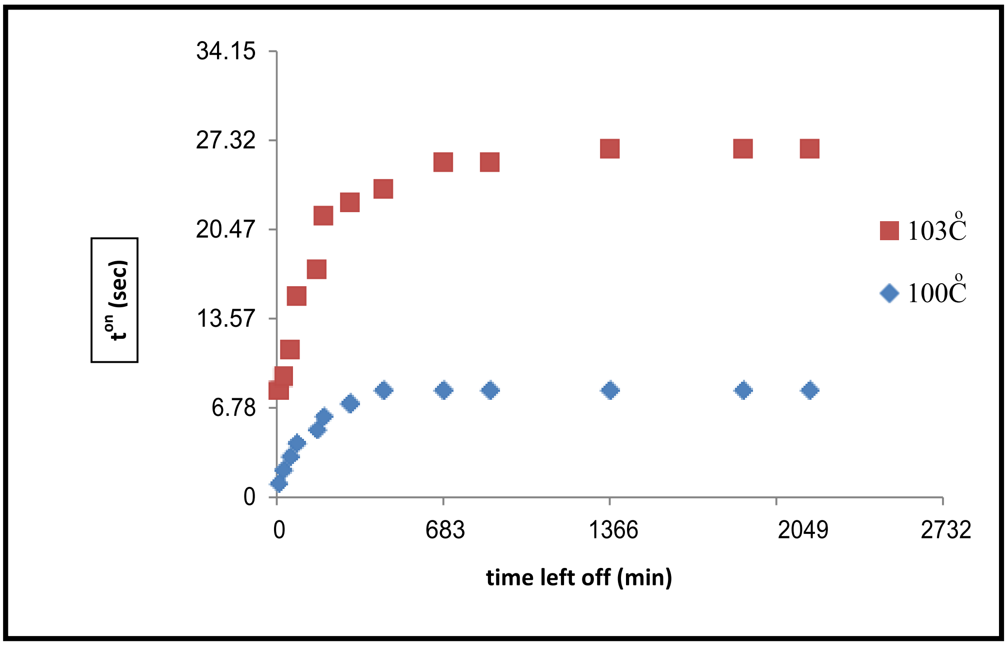


Figure (11): Switching-on (τ^{on}) and time left off (τ^{off}) for addition P 3.

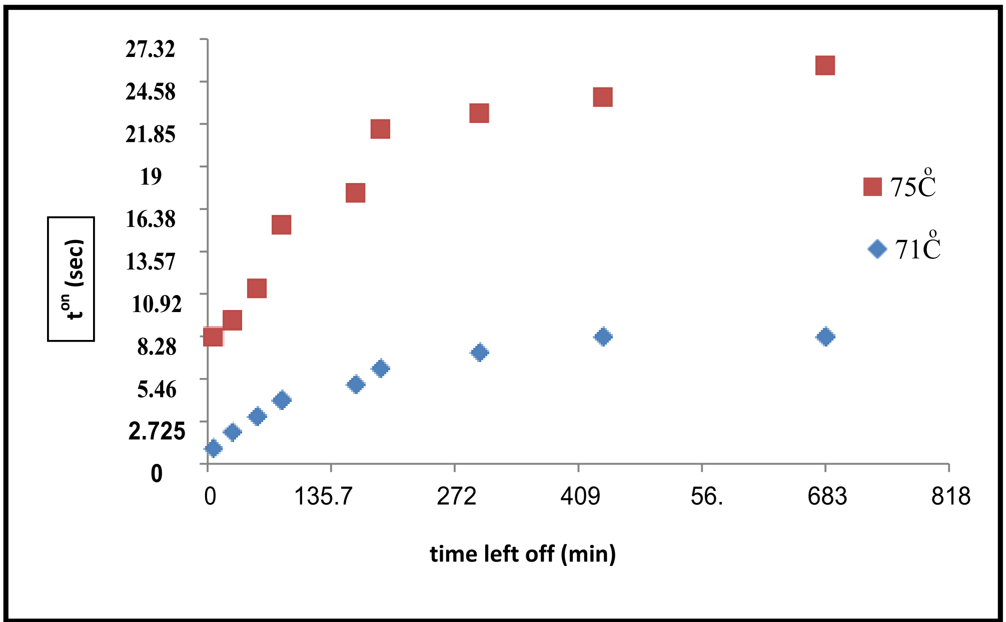
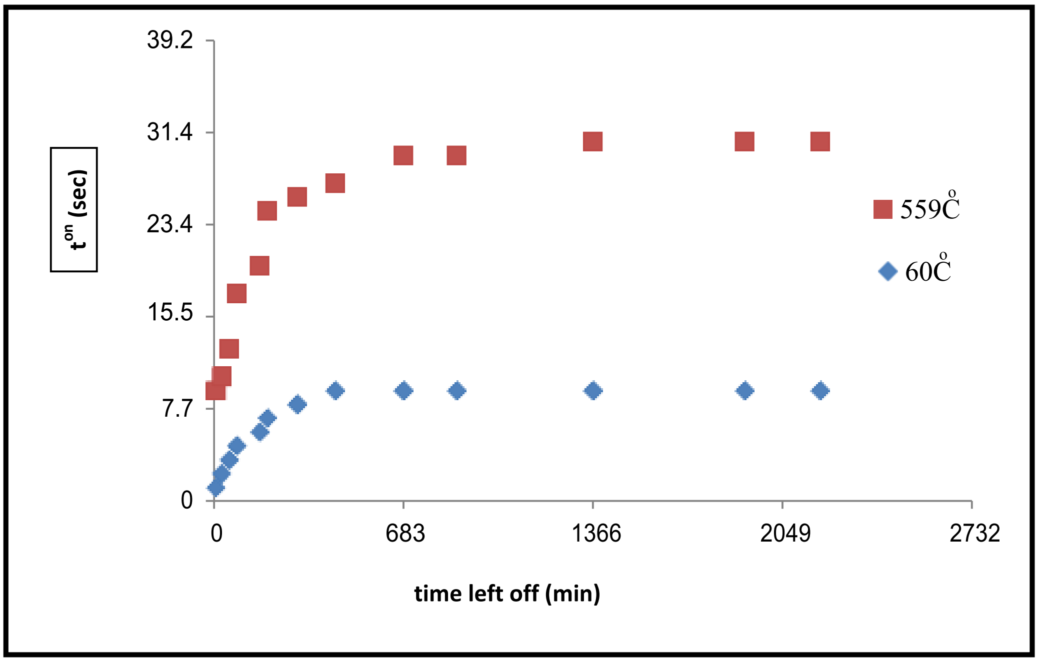
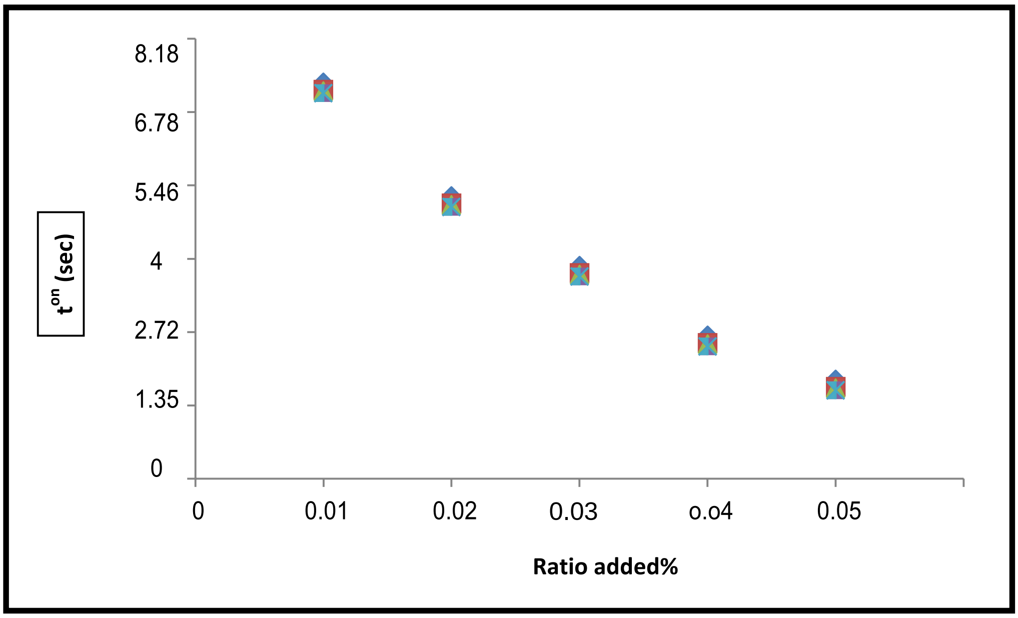


Figure (12): Switching-on (τ^{on}) and time left off (τ^{off}) for addition P4



Figure(13): Switching–on (τ^{on}) and time left off (τ^{off}) for addition P 5

As the percentage of nanomaterial added increases, the opening time decreases, and this is seen in Figure (14).



Figure(14): Switching – on (τ^{on}) as a function of the ratios addition.

4. Conclusion

To improve the work of humidity and climate measuring devices that use liquid crystals in their work, this research has focused on the electro - optic properties of a group of polymers of fixed molecular weight based on the polysiloxane backbone, when nanoparticles with different molecular weights (SnO_2) were added.

In this work, the added nanoparticles increase the electro - optic properties of the liquid crystal, and we notice that the opening period is less than the percentage increase in the added nanoparticles, i.e. we get results with less time.

Added nanoparticles (SnO_2) reduce the degree of diffusion of kiure, which reduces optical reaction times, reduces the degree of transfer of the polymer and increases the viscosity of the polymer, thereby obtaining faster and more accurate results.

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