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Original Article

Effect of Magnetic Field on Physical Properties of Flowing Salty Water

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Abstract

In this paper, the effect of magnetic field on flowing salty water (Sodium chloride 0/9% or Normal saline) has been experimentally studied. Physical properties measured, including optical transmittance, refractive index and Electrical Conductivity (EC). Other parameters are pH and brix (Dissolved Solids percent). The results show that in presence of magnetic field optical transmittance of flowing salty water increased. Refractive index and EC decreased with increasing magnetic field. Moreover pH factor of sample grown up with increasing magnetic field. Above results could be due to effect of magnetic field on molecular structure of salty water.

Key words: Magnetic field, Salty water, Optical transmittance, EC

INTRODUCTION

The action between of a magnetic field and the fluid has many applications[1]. Water is the important fluid in nature, and we useit from remove our needs. We do not still exactly reasons changes inthe properties of water as by external factors. But results show that,physical property water can be change when exposed to a magnetic field[2-3].The effect of magnetic field depend to many factors. Theseinclude the field strength and direction of the applied magneticfield[4-7]. Furthermore time of the water is in exposure field[8],thesolution flow rate of through the magnetic field and the material exist in water are other factors[9-12].

In this paper salty water (normal saline, 0.9%) was passed throughthemagnetic field for 4seconds with the flow rate 0.2 meters per second. magnetic field with various strengths (100, 200 and 300 mT)applied to the samples,this field created by the permanent magnet.

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RESULTS AND DISCUSSIONS

Many models proposed for the molecular structure of liquid water, mostly represented by the continuum models and cluster models. Cluster models for molecular structure of liquid water are shown in Figure 1. This models used in many articles for explain the properties of water. The spatial network of hydrogen bonds is one of the main properties of liquid water. The magnetic field is breaking clusters and this affects the physical properties of water [13].

In first, the number of solid particles in the solutionwas examined. Result has shown that in (Figure 2).As seen, number of solid particles decrease with increasing magnetic field strength. This is due to the increasing insolubility of salty water.

Electrical Conductivity

In this section, we discuss effect of magnetic field on electrical conductivity of flowing salty water, the results show that electrical conductivity decrease with increasing magnetic fieldstrength applied to the sample.Figure 3. This change is due to the amount of solid particles present in the solution (see Figure 2), by reducing the solid particles in solution, electrical conductivity decreases.

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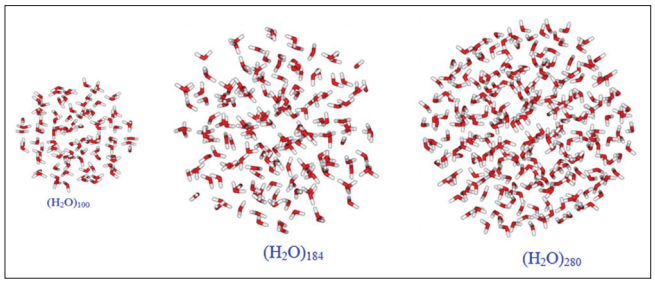

Figure 1: Calculated water cluster models[14]

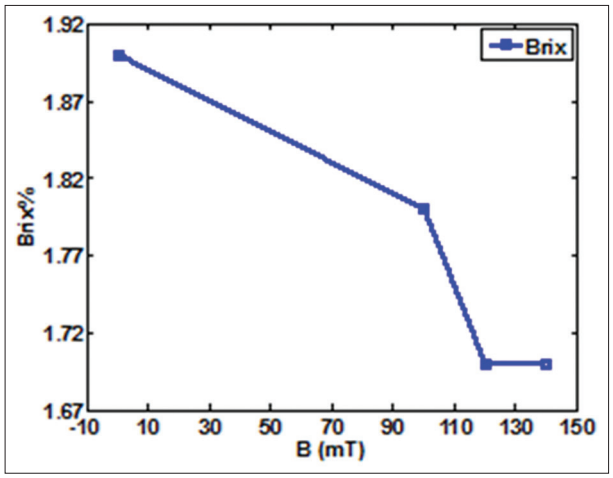

Figure 2: Number of solid particles in the solution

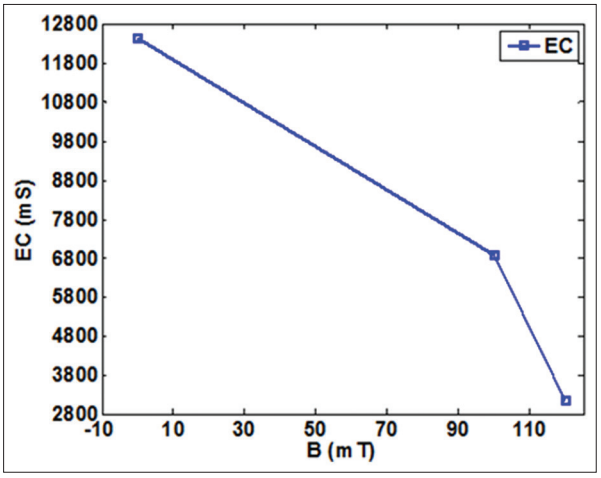

Figure 3: Electrical conductivity of flowing salty water in various magnetic field

UV-Visible

The results obtained from the transmitted UV-Visible spectra show that, before and after applying magnetic field, an increasing of transmitted light in the samples observes in the range of 200 nm to 800 nm (Figure 4). Therefore the sample that is affected by the magnetic field has more transparency. To confirm the above argument, the refractive index of samples using refractometer was studied. The results show that a decreasing in the refractive index with increasing magnetic field (Figure 5). These results are in good agreement with the results that obtained from the transmittance spectrum.

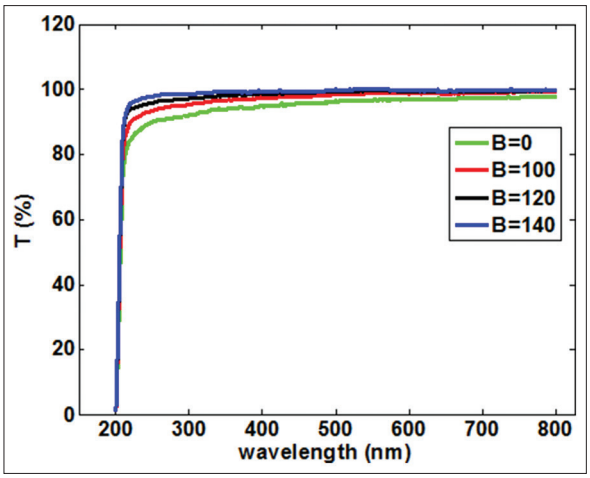

Figure 4: Transmittance of magnetized and Non- magnetized water in UV-Visible region

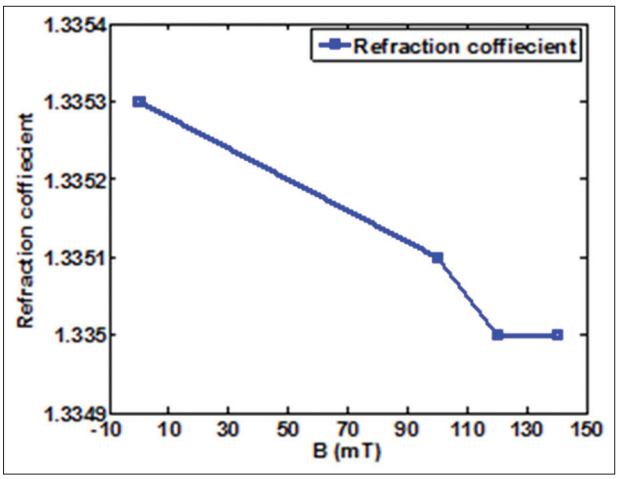

Figure 5: Refractive index as a function of the magneticfield

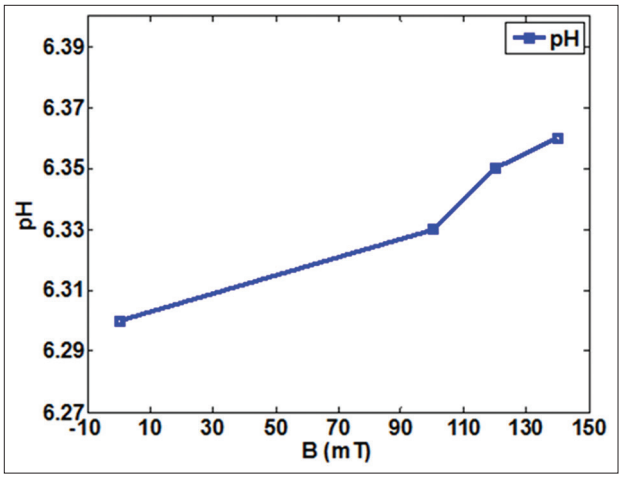

Figure 6: PH of samples as a function of the magnetic field

PH

Moreover, the results show that after of the applying of magnetic field the pH of salty water increases (Figure 6). This is due to Change in hydrogen bonds and increasing in the potential of hydrogen in a solution. This result is in excellent agreement with the results that obtained By Alimi et al., 2006and in reference [15].

CONCLUSION

In this paper, the salty water is exposed to a magnetic field;under influence of the magnetic field, the physical and chemical properties of salty water changes.Result of UV-Visible spectra show that by applying a magnetic field, optical transmittance of samples increases. This is due to the increased solubility of the sample and subsequentlyreduction of the solid particles in the sample. Moreover,the electrical conductivity of salty water decrease with increasing in magnetic field strength applied to the sample.In addition, Normal saline (salty water) with several medical applications havesame effects, thatthese effects could influence the biological properties.

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