

The Effect of Magnetic Water on Dissolving Kidney Stones

Ali M . Mousa * Ahmed S. Hmed*

Received on:22/1/2007

Accepted on:6/3/2007

Abstract

Present study considers physical characterization of magnetized water in dissolving Calcium Oxalate which is the constituent of the predominate kidney stones. The physical parameters like Total Dissolved Salts (TDS),pH value, electrical conductivity and surface tension have been evaluated in magnetized Calcium oxalate solution. This analysis shows that the Surface tension decreases with increasing magnetic field intensity and exposing time, while the other three parameters increase.

الخلاصة

أهتمت الدراسة الحالية بالتوصيف الفيزيائي للماء الممغنط في إذابة أو كزالات الكالسيوم التي تعد المكون الرئيس لحصى الكلى. تم قياس المعاملات الفيزيائية مثل الاملاح الكلية الذائبة وقيمة الدالة الحامضية والتوصلية الكهربائية والشد السطحي في محلول أو كزالات الكالسيوم المعالج مغناطيسا. من تحليل النتائج ظهر أن الشد السطحي يقل بزيادة شدة المجال المغناطيسي وزمن التعرض , بينما تزداد الاملاح الكلية الذائبة والدالة الحامضية بزيادة شدة المجال المغناطيسي وزمن التعرض.

Introduction

Kidney stone disease or “Nephrolithiasis “is a common disorder, found most often in middle- aged men (1,2). It occurs when certain chemicals in the urine form crystals that stick together (3,4). Most stones start forming in the kidney, and some may travel to other parts of the urinary tract, including the ureter or bladder. As stones are formed, they may vary in size, with the larger stones potentially blocking the flow of urine or irritating the lining of the urinary tract. The main stones types are Calcium stones (78%), infection related stones (15%),Uric acid stones(5%) and Cystine stones(1%) (5).

For patients that have passed their first kidney stone, it is difficult to predict the likelihood of recurrence. Seventy percent of patients who pass one stone will have another within 10 years(6). If the stones are too large to expel, then the most common used technique is extracorporeal shock wave Lithotripsy (ESWL).This procedure uses shock waves to travel through the tissue and crush the stones.

Doctors urge their patients to drink more water (at least 2 liters per day).water helps to dilute the urine and prevent the formation of stones(7). It also helps flush out the smaller. Tap water having limited degree of dissociation for

*Dep. of Applied Science Univ.of Tech.

salts, while exposing water to magnet changes its physiochemical properties, or 1

-ve side of the calcium oxalate dipole enhancing the dissolving of calcium oxalate. However the efficacy of

2-Experimental

The experimental setup used in this work consists of dc-power supplied magnets system fabricated by Cenco company it consist of two coils with two poles of 11 cm in diameter and variable gap. The magnetic field intensities range used is (0.3-1.1 T) measured at the middle between the poles by Tesla meter type Radial from (F.W.Bell company) (10).

The solutions used are tap water and calcium oxalate solution. The salt solution was prepared by dissolving (20 mgm) of CaC_2O_4 in 200ml of distilled water. The test was carried on (15 ml) of the solution poured in a tube. In all measurements the $\gamma = 1/4$ (dhgp)

where d is tube diameter, h is the height of solution and ρ solution density is the gravity.

3- Results and discussion

Tap water

Figure (1a,b) shows the results of tap water TDS when exposed to the variable magnetic field at constant exposing time (10 min.) ,and variable time at (0.3 T). ratios of dissolving salts per Both curves consist of two parts with different unit of magnetic field. The first part in figure (1a) ($B < 0.2$ T) shows a high ratio (57 ppm/ T) ,and here the salts with high degree of dissociation have the great influence. In the second part the salts which needed greater energy for

magnetic treatment depends on both field strength and exposing time.

The aim of the present study is to determine the effectiveness of magnetic water in dissolving Calcium Oxalate. The study spanned a range of magnetic field intensities and exposing times.

pH values was measured 1 min. after the DC power supply was turned off using pH meter (PHM84 radiometer Copenhagen) and immediately the electrical conductivity was measured using portable EC meter (H198303),while total dissolved salts was measured with portable TDS meter (H198301).Surface tension was calculated using capillary tube method ,the surface tension (γ) is given by (11)

dissociation affect the behavior with ratio (21.7 ppm/ T).

In Figure (1b) the first region where the exposing time is less than 10min.the dissolving rate is (1.6 ppm/min.).This result confirms the idea of the influence of the degree of dissociation. The main feature in both curves is the increase in the TDS value with both parameters.

*Dep. of Applied Science Univ.of Tech.

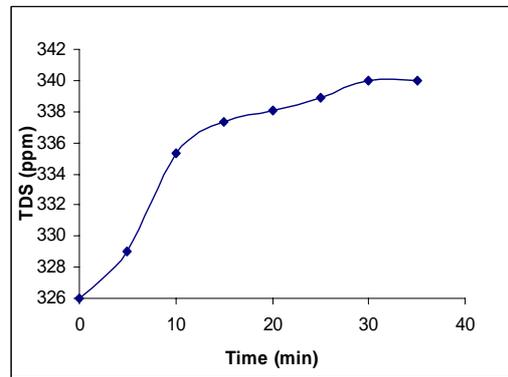
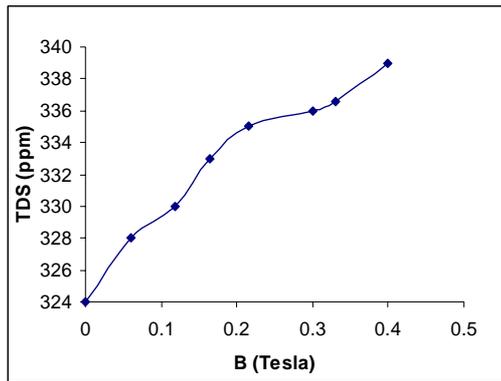
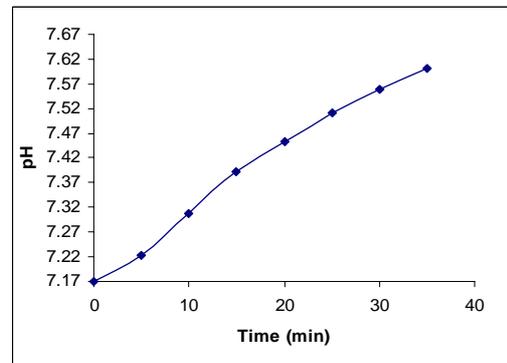
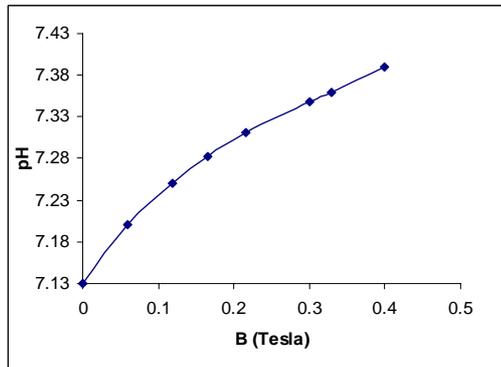


Figure (1a,b) The total dissolved salts with (a) magnetic field and (b) exposing time

Figure(2a,b) shows the variation in pH values with field intensity and exposing time, and this is more probably due to the decrease in Hydrogen ion concentration.



Figure(2a,b) the pH values versus field intensity and exposing time.

Figure (3a,b) shows a plot of electrical conductivity versus magnetic field intensity and exposing time. In Figure (3a) showing range of magnetic fields ($0.05 < B < 0.3$ T) the electrical conductivity increases with ratio of ($67 \mu\text{s/cmT}$), and for higher fields the increase is a little greater ($71 \mu\text{s/cmT}$), besides the degree of dissociation which

affects the concentration of ions, the mobility of the ions plays a great role in increasing the conductivity. In Figure (3b) it is very clear that for exposing time less than 10 minutes the increasing rate is much faster ($1.5 \mu\text{s/cm min}$) than for longer exposing time ($0.6 \mu\text{s/cm min}$) and this may be attributed to the greater mobility of low dissociation ions salts.

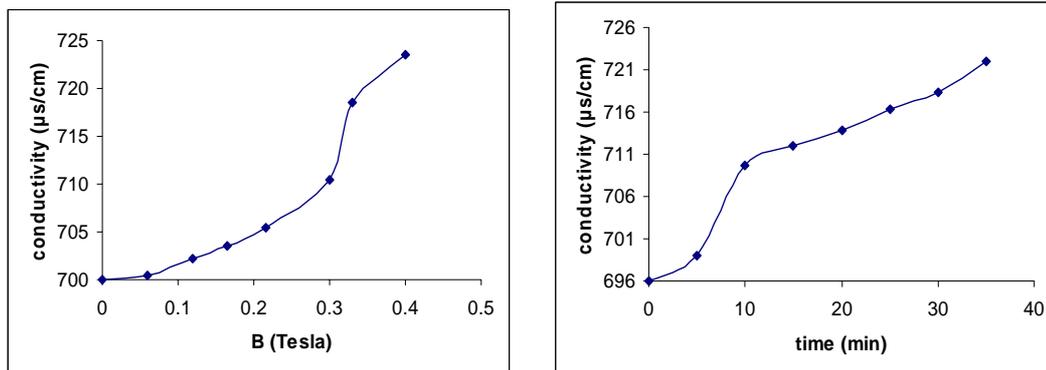


Figure (3a,b) Electrical conductivity vs. magnetic field intensity and exposing time.

Figure (4a,b) shows the variation in surface tension as a function of both magnetic field intensity and exposing time. The general trend in both curves is the decrease in surface tension with both

parameters. More probably this is due to the variation in the attractive force between water molecules caused by the applied magnetic field.

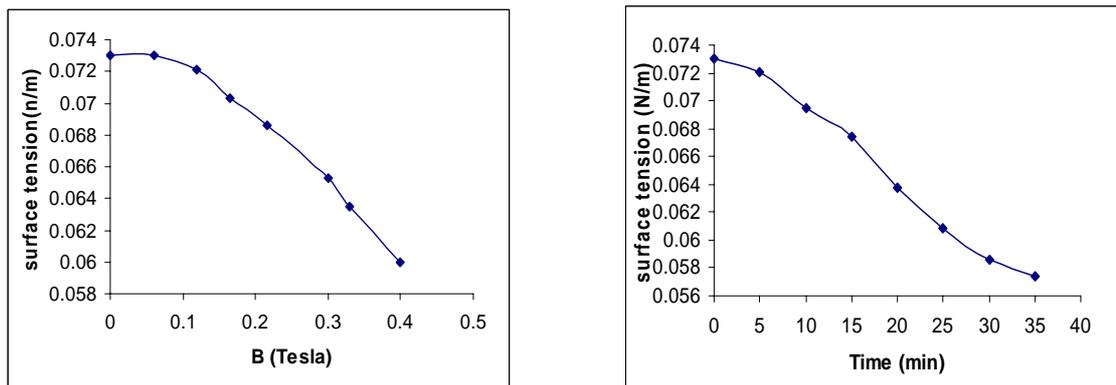


Figure (4a,b) Surface tension as a function of magnetic field and exposing time

Calcium Oxalate solution

As mentioned previously, calcium oxalate is the major constituent of kidney stones. Magnetic water has a great influence on dissolving calcium oxalate. Figure (5a,b) shows the TDS as a function of magnetic field intensity and exposing time. For all ($B \leq 0.8$ T) no change in the TDS could be noticed, while for higher field intensity the increase is very sharp (exponential). This could be due to the high degree of dissociation of calcium oxalate. Figure

(5b) shows the TDS increasing with exposing time at fixed field intensity ($B=0.9$). Here also for time less than 15 minutes no change in TDS takes place, a linear increase starts for longer times at a rate of (2 ppm/min.). From the two curves it is clear that the field intensity having the greater influence i.e. by increasing the field intensity we can reduce the exposing time. Also in both curves no saturation takes place as in the case of tap water.

*Dep. of Applied Science Univ. of Tech.

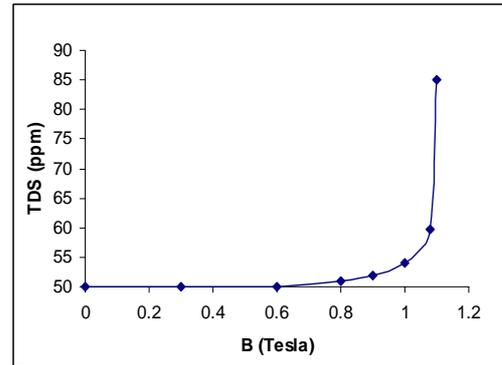
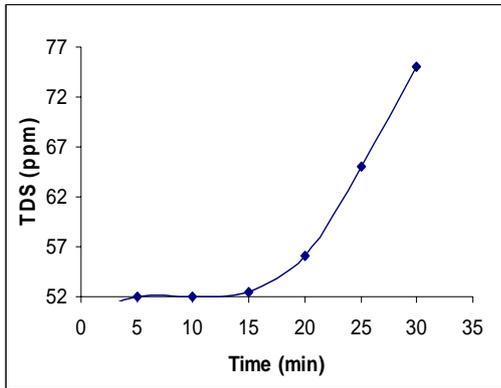


Figure (5a,b) The TDS as a function of magnetic field intensity and exposing time

Figure (6a, b) shows the electrical conductivity versus the field intensity and exposing time. From Figure. (6a) for ($B \leq 0.3T$) the electrical conductivity is constant, and for higher field intensity ($B \geq 0.8 T$) the electrical conductivity shows increasing trend which could be explained by

$$\bar{\sigma} \propto \exp(B)$$

The increase in $\bar{\sigma}$ for the range ($0.3 \leq B \leq 0.8 T$) {although the TDS is constant as in (Figure.5a)} is due to the increasing of charge carriers mobility. The effect of charge carriers mobility is behind the increase in the electrical conductivity for exposing time less than 15min as shown in Figure (6b)

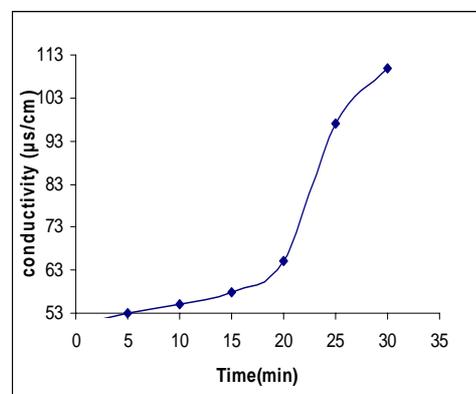
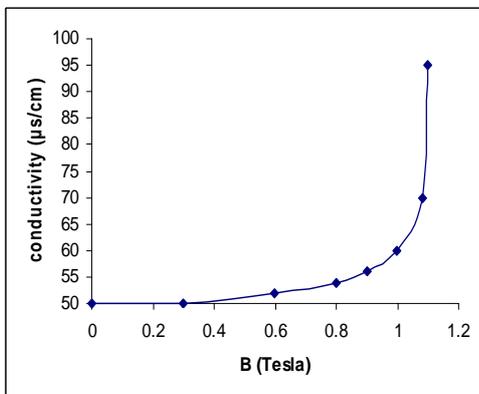


Figure (6a, b) The electrical conductivity vs. the magnetic field intensity and exposing t Figure (6a, b) The electrical conductivity vs. the magnetic field intensity and exposing time

Figure (7) compares optical photo of the dissolved CaC_2O_4 . Left structure (a) belongs to untreated solution and right structure (b) is after treatment at 0.6T for 10 minutes while(c) is treated with 1T for 10 minutes .From the photos it is clear that increasing the intensity of magnetic

field will be accompanied by a decrease in the size of deposit. The influence of increasing exposing time on deposited pattern is shown in Figure (8) where the deposited grain size is strongly reduced and no accumu- lation of deposited grains takes place.

*Dep. of Applied Science Univ.of Tech.

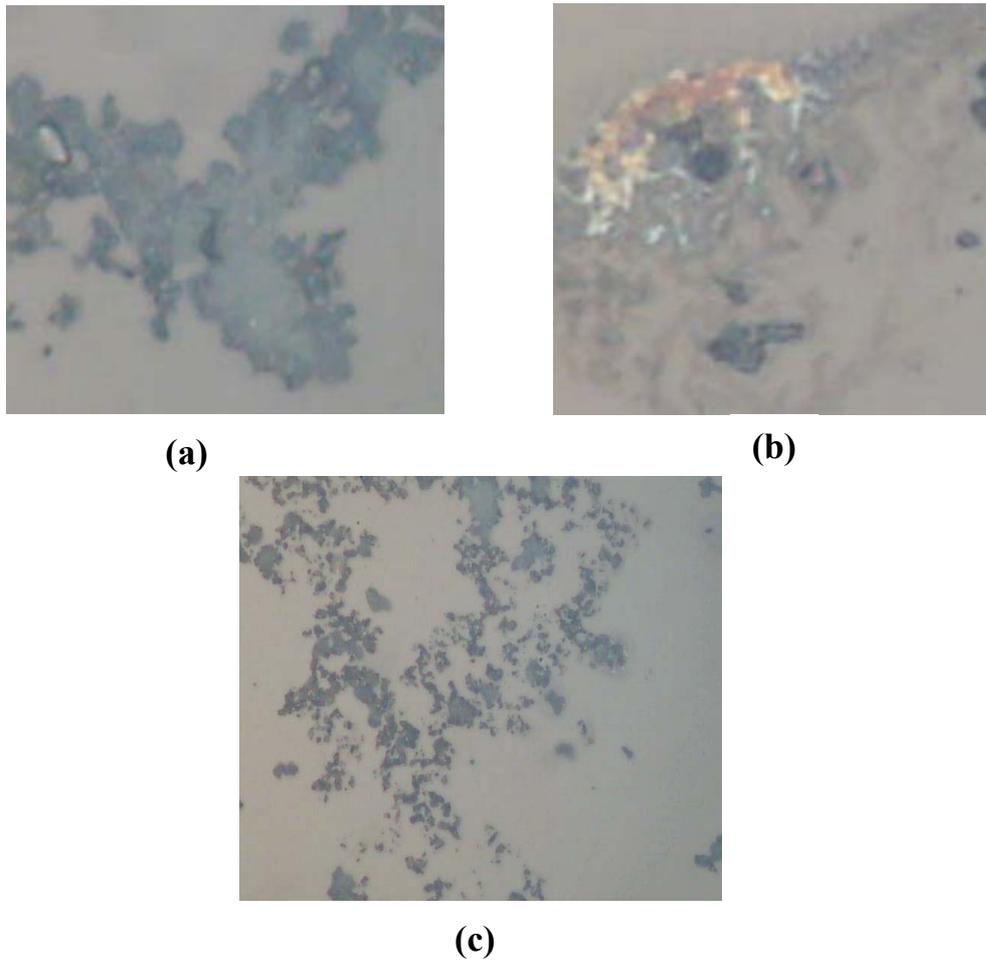
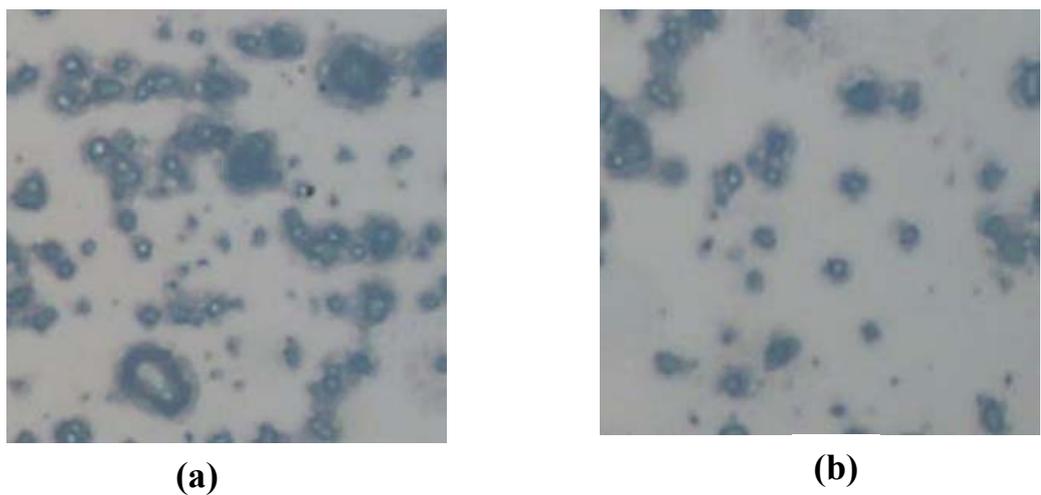


Figure (7); The optical microscope pictures of CaC_2O_4 deposits of magnetically treated solution (a) before magnetic treatment, (b) treated at 0.6T and time 10min, and (c) treated at 1T and time 10min X 450.



Conclusion: Figure (8); The optical microscope pictures of CaC_2O_4 deposits of magnetically treated solution (a) at time of treatment 20min and magnetic field 0.9T, (b) at time of treatment 30min and magnetic field 0.9T. X 450

*Dep. of Applied Science Univ. of Tech.

Conclusions

Measurements of calcium oxalate solution parameters exposed to different magnetic field intensities and different exposing times reveal that the dissolving efficiency of the treated water increases. The results also show that the size and patterns of deposited CaC_2O_4 strongly change with the treatment conditions.

Acknowledgement

The author Ali M. Mousa thanks to the ministry of higher education and scientific

Research for financial assistance under the research project number 372-2006.

References

- 1-Souncie JM, Thun MJ., Coates RJ, Maclellan W., Austin H; *Kidney International* 46 (1994), 893-899
- 2-Khan Sr, Glenton PA; *Journal of Urology* 153 (1995), 811-817.
- 3-Kok DJ, Khan SR; *Kidney International* ,46(1994), 847-854.
- 4-Anjian Xie, Yuhua Shen, Dong Ma, Fangzhi Huang, Lingguang Qiu, Shikuo Li, Long 6- Chen; *Crtst. Res. Technol.* Vol.42, No.7, (2007), 667-672.
- R., P. Plasgura, A. Petrik, G. Louzensky, K. Bartonickova and J. Dvoracek; *B Journal of Urology* 84, (1999), 393-398.
- 7-Phillip M. Hall ; *Cleveland Clinic Journal of Medicine* ; Vol.69, No.11 (2002), 885-888.
- 5-Sutor DJ. Wooley SE ,Lingworth JJ ; *B Journal of Urology* ,46 (1974), 275-88.
- 8- Baker J.S. and S.J. Judd; *Water Res.* 30,2,(1996) 247-260.
- 9- Szkatula, A. M. Balanda, and M. Kopec; *Eur. Phys. J. AP* ,18,(2002), 41-49.
- 10- V.I. Kalikmanov ; *Europhys. Lett.* 13 (1990) 745.
- 11- Smith C. ,PP. Coetzee ,JP. Meyer; <http://www.wrc.org.za>.