



## DETERMINATION OF DIELECTRIC CONSTANT OF PSYCHO PHARMACEUTICAL DRUGS

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### ABSTRACT

Dielectric constant of psycho pharmaceutical drugs has been determined at room temperature. Permittivity is the key factor in the process of drugs formation and solubility prediction.

**KEY WORDS:** Dielectric constant, Psycho pharmaceutical Drugs, Determination.

### INTRODUCTION

The dielectric constant is a property of an electrical insulating material, which is the ratio of capacitance of the capacitor filled with the given material to the capacity of vacuum.<sup>[1]</sup> In the psycho pharmaceutical drugs formation process, the dielectric spectroscopy provides information on, structural characteristics of polymers, gels, proteins and emulsions, composition of mixtures, properties of membranes, coatings and films, water content, the state of the water, and the effects of water as a plasticizer lyophilization (freeze drying) of biomolecules<sup>[2]</sup>.

Mohammad A. et. Al (2010)<sup>[3]</sup> reported importance of dielectric constant in pharmacy. The solubility of psycho pharmaceutical drugs is permittivity dependent; it increases with dielectric constant of the solvent. For improving solubility and making drug easy to use, is highly demanded in the pharmaceutical industries.

Paruta A. N. (1962)<sup>[4]</sup> studied relation between dielectric constant and concentration of sucrose. Generally the pharmaceutical solvent systems are composed of such a substances, which exhibit a high degree of intermolecular association. The dielectric constants of such system would not be expected to be a simple additive function of the concentrations of the components<sup>[5]</sup>.

The solubility of solvent is dielectric constant dependent. With higher dielectric constant can cause more ionization of the solute and results into more solubilization. An example, water dielectric constant which is 78.5 has higher dissociation strength on ions in comparison with ethanol dielectric constant 24.2 which is resulted in more solubilization power of ions in water<sup>[6]</sup>.



**EXPERIMENTAL:**

The fully featured microcontroller based dielectric constant meter <sup>[7-9]</sup> is used, which is based on the frequency measurement. The change in capacitance is the function of frequency variation which is used to calculate the dielectric constant of the drug sample. The figure 1 shows block diagram of experimental setup.

The dielectric constant of solution in this technique can be estimated by the equation.

$$\epsilon_x = 1 + \frac{f_r}{f_x} \left[ \frac{f_0 - f_x}{f_0 - f_r} \right] (\epsilon_r - 1) \quad (1)$$

1)

Where,

$\epsilon_x$ -is dielectric constant of unknown liquid,  $f_r$ - is reference liquid frequency count,

$f_x$ -is the unknown liquid frequency count,  $f_0$ - is frequency count without liquid,

$\epsilon_r$ -is reference liquid dielectric constant

**PROCEDURE:**

Firstly the sample holder cell has been cleaned with Acetone, and then it connects to the input knob of dielectric meter. At room temperature the frequency count without drug sample is measured. Later on the reference liquid (Benzene) is inserting in to the sample holder cell and frequency count is measured. After that, one by one, by inserting drug samples in to sample holder cell, the frequency is measured. For every sample, cell assembly has been cleaned with the Acetone, dry with dryer and used for another sample.

**RESULTS AND DISCUSSION:****Systems of Sample Under study:**

With the discussion among psycho pharmaceutical experts about the psycho pharmaceutical drugs, some of them which are utilize frequently, are obtained commercially and used without further purification. In present study Hydroxyzine Hydrochloride syrup (Atrax)<sup>[10]</sup>, midazolam injection (Mezolam)<sup>[11]</sup>, Lorazepam injection (Lorel)<sup>[12]</sup>, Diazepam Injection (Lori)<sup>[13]</sup>, Metronidazole (Metris), Ornidazole infusion (Ornidazole), Ofloxacin infusion (Ofloxacin ZO-IV) psycho pharmaceutical drug samples are used.

**Observations-**

Frequency count without liquid  $f_0$  - 432.0 KHz.

Frequency count of reference liquid (Benzene)  $f_r$  - 429.3 KHz.

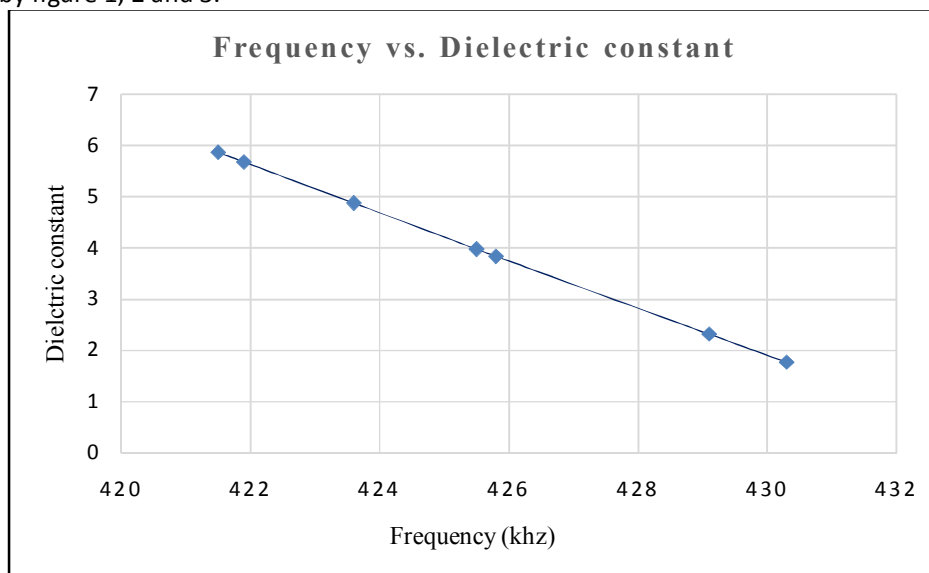
Room temperature - 306°K.

**Table 1. Observation table of Frequency and Dielectric Constant**

Sr. No.	Chemicals	Frequency ' $f_x$ ' KHz	Capacitance 'C' nf	' $\epsilon_x$ '	Literature value ' $\epsilon$ '
1	Hydroxyzine Hydrochloride ( $C_{21}H_{29}Cl_3N_2O_2$ )	430.3	0.2323	1.77	1.50
2	Diazepam ( $C_{16}H_{13}ClN_2O$ )	429.1	0.233	2.32	1.08
3	Midazolam	425.8	0.2348	3.84	3.67

	( $C_{18}H_{13}ClFN_3$ )				
4	Lorazepam ( $C_{15}H_{10}Cl_2N_2O_2$ )	425.5	0.235	3.98	3.31
5	Ofloxacin ( $C_{18}H_{20}FN_3O_4$ )	423.6	0.236	4.88	-----
6	Metronidazole ( $C_6H_9N_3O_3$ )	421.9	0.237	5.68	-----
7	Ornidazole ( $C_7H_{10}ClN_3O_3$ )	421.5	0.237	5.87	-----

The experimentally observed frequency count is used to determine capacitance and dielectric constants of psycho pharmaceutical drug sample. One can easily compare determined values of dielectric constant with reference value reported for the data at 298<sup>0</sup>K<sup>[14-17]</sup>. The graphical representation of results is shown by figure 1, 2 and 3.



**Figure 1. Graph of Frequency Vs Dielectric Constant**

From figure 1 it is observed that, when the frequency of psycho pharmaceutical drug sample is increased then the corresponding dielectric constant decreases.

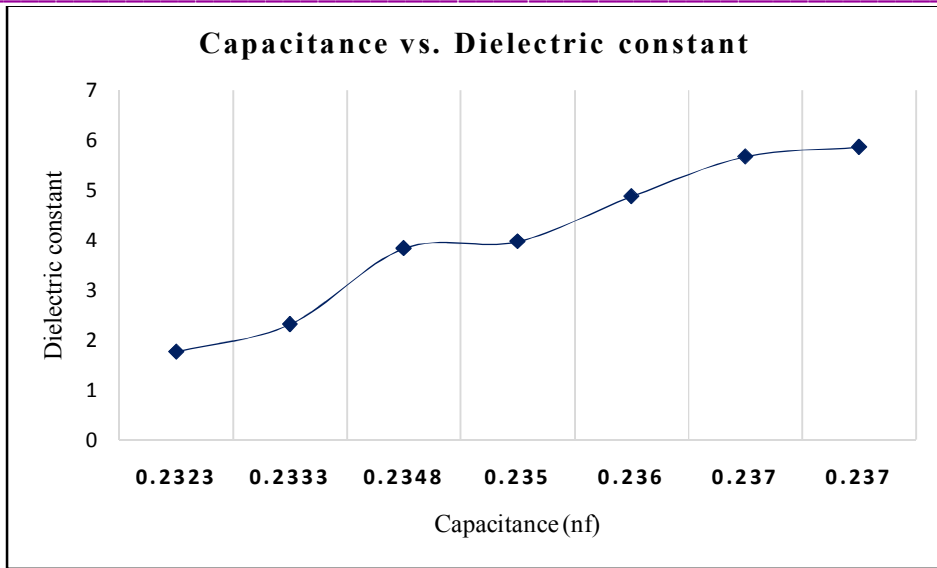


Figure 2. Graph of Capacitance Vs Dielectric Constant

The figure 2 indicates the increase in capacitance of psycho pharmaceutical drug sample with the dielectric constant.

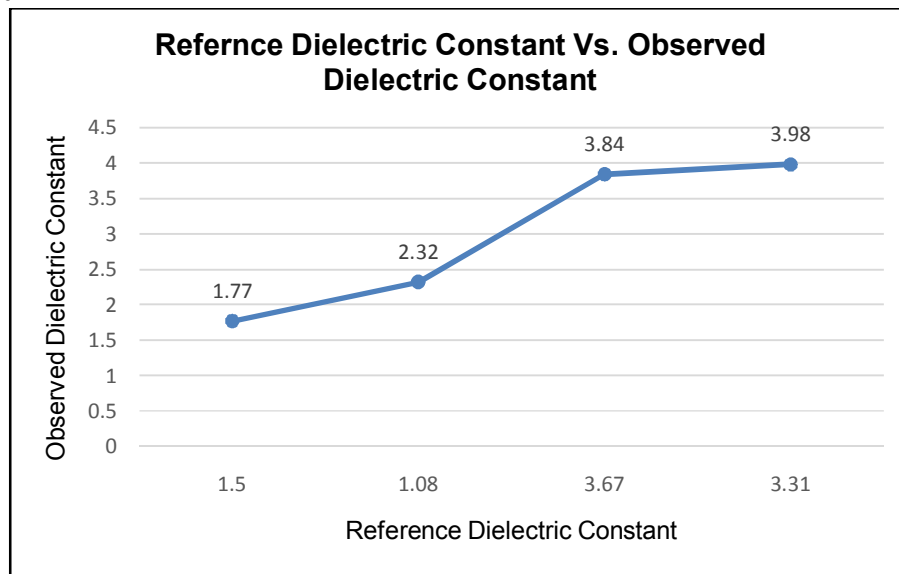


Figure 3. Graph of Observed 'ε<sub>x</sub>' Vs reference 'ε' Dielectric Constant

The results of the present study are in good agreement with the literature values is shown by figure 4. The variance in observed and literature values of dielectric constant is, due to the dielectric constant has correlation with temperature.

**CONCLUSION:**

The dielectric constant of psycho pharmaceutical drug Hydroxyzine Hydrochloride syrup (Atrax), midazolam injection (Mezolam), Lorazepam injection (Lorel), Diazepam Injection (Lori), Metronidazole (Metris), Ornidazole infusion (Ornidazole), Ofloxacin infusion (Ofloxacin ZO-IV) has been determined. From figure 1 observed that, when the frequency of psycho pharmaceutical drug sample is increased then the

corresponding dielectric constant decreases. The figure 2 indicates the increase in capacitance of psycho pharmaceutical drug sample with the dielectric constant. The results of the present study are in good agreement with the literature values is shown by figure 3. The variance in observed and literature values of dielectric constant is, due to the dielectric constant has correlation with temperature.

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