physico chemical studies on some solid or ganic compounds

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The work carried out in this thesis presented in five main chapters. The first chapter, is the general introduction which containsliterature survey about the investigated samples and the aim of work.The second chapter, describes the theoretical and the differentcalculation methods used for analyzing the results (DC-, AC-conductivity, dielectric constant s’ and dielectric loss e”).The third chapter, shows the experimental methods including the preparation methods of investigated compounds by mixing sodium and/or potassium carbonate with different organic acids (oxalic, malonic, succinic, tartaric, maleic, phthalic and terephthalic). This chapter includes also the techniques used in the investigation of the samples (Atomic absorption, IR, TG and DTA) and in measuring the electricalproperties.In the fourth chapter, the results of the thermal stability and the characterization of the pfepared compounds were reported and discussed.In the fifth chapter, the results of DC- and AC-conductivity, relative permittivity e’ and dielectric loss e” for the investigated samples at a wide range of temperature 78 — 420 K and frequency of 102- 106 Hz were reported and discussed.The main conclusions are the following:(1) All of the investigated substances did not show switchingphenomenon -at room temperature and obeys Ohm’s low at a voltage up to 1000V.(2)The DC conductivity obtained at 310K for the pure organic acids was found to decrease in the order:citric > oxalic > tartaric > maleic > malonic > succinicThis order conicides well with decreasing the acidity of the organic acids investigated.(3)H+ participitates in the conduction process of pure organic acids(4)The increase in the number of (CH2-) group causes more decrease in the aDC of the organic acids.(5)aAC are higher than CDC for the pure organic acids (except citric acid), due to that the applied frequency acts as a pumping force helping in moving the charge carriers and increases the conduction. The discrepancies observed in the results of citric acid may be attributed to a change in type of conduction mechanism, where band theory may predominates in case of citric acid.(6)The breaks occurring in the electrical properties data with temperature (at lower temperatures) confirmed the presence of some phase transitions in the compounds investigated.There are many types of polarization in the organic acids, the most important of them is the ionic polarization.The values of s’ are less than 40 for the pure organic acids at the whole temperature range investigated which refers to that these compounds behave as simple dielectric materials especially at lower temperatures.(9)The DC-conductivity obtained at 310K was found to follow the following order:For sodium hydrogen salts:maleate > tartrate > succinate > malonate > oxalate phthalate > terephthalateFor potassium hydrogen salts:maleate > malonate > oxalate > tartrate > succinate terephthalate > phthalate.For sodium potassium salts:succinate > maleate > oxalate > tartratephthalate > terephthalateIt means that the introducing of Na+ or / and K+ causes a change in conductivity values. This is explained on the basis of variation in the crystal structure and the differences in ionic radii of Na+ and K+ ions.(10)The DC-conductivity showed a semimetallic behaviour at lower temperature for the following salts: sodium hydrogen maleate, sodium hydrogen ’phthalate, potassium hydrogen succinate, potassium hydrogen malonate, potassium hydrogen phthalate, sodium potassium succinate and sodium potassium phthalate. This is explained on the basis of hopping model by postulating an electron just below the Fermi level hopping to distant state for which the required energy is as small as possible.(11)Also the DC-conductivity showed metallic behaviour at lower temperature in case of sodium hydrogen oxalate, potassium hydrogen oxalate, sodium potassium oxalate, potassium hydrogen tartrate and sodium potassium phthalate. This is because the number of mobile electrons at these lower temperatures is large and remains constant, but their mobility gradually decreases with temperature due to the electron-phonon collisions. So that, the conductivity gradually DROPs with rising temperatures.(12)The DC-conductivity for all the salts of organic acids showed also semiconducting and insulating behaviour at certain temperature ranges depending on their compositions.(13)The AC-conductivity obtained at 310K and frequency of 103 lcHz decreases in the order:For sodium hydrogen salts:maleate > tartrate > succinate > malonate > oxalate phthalate > terephthalateFor potassium hydrogen salts:maleate > malonate > oxalate > tartrate > succinate terephthalate > phthalateFor sodium potassium salts:maleate > succinate > oxalate > tartratephthalate > terephthalateThis order differs than that observed in ax-results, -due to thedifference presents in the polarizability of the different salts.(14)The AC conductivity (cAc) obtained at 310K and 103 kHz showed a semimetallic behaviour for sodium hydrogen maleate, sodium hydrogen succinate, sodium hydrogen terephthalate, sodium hydrogen malonate, potassium hydrogen malonate, potassium hydrogen tartrate, potassium hydrogen succinate, potassium hydrogen maleate,sodium potassium maleate, sodium potassium succinate, sodium potassium tartrate and sodium potassium terephthalate.(15)whereas, the CAC obtained at 310K and 103 kHz showed mettallicbehaviour for sodium hydrogen phthalate, sodium hydrogenoxalate, potassium hydrogen oxalate, potassium hydrogenterephthalate and sodium potassium oxalate.(16)At higher temperature all organic acid salts organic acids show a semiconducting behaviour.(17)All the salts of organic acids are classified as simple dielectricmaterials, except sodium potassium maleate, sodium potassiumsuccinate, sodium potassium tartrate, potassium hydrogen maleate,sodium hydrogen tartrate and sodium potassium phthalate(18)The high c’-value of potassium hydrogen maleate, sodium potassium tartrate, sodium hydrogen tartrate and sodium potassium phthalate (6’ — 100) can be used as a criterion for classified these compounds as a ferrielectric materials.(19)The high values of (6’) for sodium potassium succinate and sodium potassium maleate refer to classifying these compounds asferroelectric materials.(20) The general structure of sodium potassium phthalate can be fairly compared with those related acid phthalates, which may suggest the possible use of mixed salts of phthalic as a monochromator crystal in X-ray fluorescence.(2 1) The investigated acids and their salts can be used in many electronic circuits depending on the wide range of their conductivity values.