electrical optical and a coustical properties of potassium hydrogen carbonate ionic conductor

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The single crystal samples of KHCO3 have been prepared by slow evaporation method of an aqueous solution.Characterization of the single crystals has been done using X-ray diffraction, Infrared transmittance spectra and differential scanning calorimeter (DSC). X—ray diffraction study illustrated that the sample is a monoclinic crystal with space group P2,/a. The DSC of KHCO3 crystal has been studied which showed an endothermic peak following a rate processes. The activation energy of transition was calculated using Kissinger method.The dc electrical conductivity of KHCO3 samples was studied over a temperature range from room temperature to 370 K. The general behavior shows two regions, one at relatively low temperature range, which shows an increasing behavior with temperature, and the other one appears at higher temperature range, which shows a decreasing behavior with temperature. The activation energy of conduction in the activated part and activation energy concerning the charge carriers scattering have been found as 1.9 eV and 1.7 eV respectively.The total conductivity of KHCO3 crystal is studied in the frequency range 50 Hz-1MHz and in the temperature range 300-370 K. The conductivity frequency dependence relation is divided into three regions; one at low frequency (dc conductivity)while the others appears at moderate and relatively higher frequency range. In general, the conductivity frequency dependence obeys a doublepower law relation, (riot = ado + A& +B(0(1. The powers p and q have been found to be in the range 0 to 1 and 1 to 2, respectively.The frequency and temperature dependence of the dielectric permitivity a’ and dielectric loss a” of the investigated sample are studied. The general behaviour shows an abrupt increase in a’ and a” at the transition temperature T-322 K. The values of a’ and E” show a decreasing behavior as the -frequency was increased.The bulk conductivity ab, relaxation time T and thermody namic parameters have been obtained by means of the complex impedance technique. The relaxation time-temperature dependence shows two regions, one at relatively low temperature range, where T shows a decreasing behavior with temperature, while the other one at the high temperature range, T shows an increasing behavior with temperature.The optical absorption at the absorption edge of KHCO3 single crystal in the temperature range around the phase transition temperature (TF = 322 K)have been carried out. The sample exhibited exponential behavior of the absorption edge following Urbach’s rule. The type of transition was found to be direct forbidden transition one. The optical parameters were

determined and their temperature dependence was discussed and the drastic variations of all parameters at TF were detected.The ultrasonic attenuation coefficient ((3) of KHCO3 single crystals was studied over a temperature range from room temperature up to 370K. the general behavior showed two essential activated regions. The activation energies are estimated and discussed.