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Study the Effect of Addition Ago on the Physical Properties of Compound Superconducting

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Abstract: In this research, we Study the Effect of (Ago) on compound (Pbx $Ba2Ca2Cu$x $ZnO8+\delta$) based on mercury at a concentration of x = (0, 0.1,0.2) The conventional solid-state reaction method was used in the preparation of the samples. They were kept at a sintering temperature of (800°C) in 48 h. The specimens were then cooled to the ambient temperature with the same heating rate. A four-probe resistivity measure was used to determine the critical temperature.

Keywords: Ago, Superconductors, four-probe technique, Critical temperature.

2-Introduction.

A small group of materials in the case when exposed to very low temperatures of nearly absolute zero exhibit a unique form known as superconductivity in which electric current passes through the lattice almost without resistance. (Lack of opposition) [1]. In fact, the critical temperature can be described as the temperature at which the particular electrical resistance of a substance disappears completely, a change that occurs suddenly upon subjecting the substance in question to the superconducting state. Their classification as such materials is usually made on a careful interpretation of the coupling of the conduction electrons in such materials with their underlying lattice nuclei. The remarkable phenomenon is seen in several compounds that are cooled (usually in liquid helium) to cryogenic temperatures, thus achieving the critical temperature one which the onset of superconductivity occurs [2]. The critical temperature value varies from one element to drops sharply,

In contrast, resistance gradually declines in compounds. HTS is its abbreviation. A scientist named Onnes Kimberling discovered in 1911 that mercury had a low resistance and abruptly dropped to a very low value of up to 4.2k, which is an acronym for the meaning of superconductors' high temperature. The quest is still ongoing.

Some materials have superconductivity to a temperature of 130 degrees K or higher [3], and new forms of oxides with temperatures exceeding 77 degrees K have become the focus of future research until the two scientists (Muller Alex Kirk and Bednorz George J.) made the discovery in 1986.

The following are some characteristics of superconducting conductors:

1. Critical temperature: There are several materials which lose their electrical resistance at low temperatures, a phenomenon which we refer to as superconductivity. This transition temperature is known as the critical temperature and it depends on the different compounds.

2. Critical magnetic field: this characteristic is defined by the electrical resistance's capacity to reappear when it is shed by a magnetic field with a value higher than the critical value. The critical field's magnitude is dependent on a number of variables, such as the material's quality and temperature, at which point the material transitions from the superconducting to the normal state.

3. Critical current: The lack of electrical conductivity property is not limited to shedding an appropriate magnetic field, but rather on the passage of current. This is because the scientist Wanis attempted to pass large currents in superconductors until he obtained enormous magnetic fields, but he soon realized that the internal magnetic fields created by these currents would make superconductors impossible because breaking down this phenomenon of superconduction by the field limits the maximum value of the current that can be reached by this material. The material's geometry, composition, and the strength of the passing magnetic field are some of the other variables that affect the critical current value [4]

3-Experimental.

The samples were prepared in the form of pure oxides according to the compound (Pbx Ba2Ca2Cu ZnO8+δ), using the SSR method) solid-state reaction, which is one of the best and easiest preparatory methods compared to other preparation conditions (such as gel sol and sedimentation ... etc) and the oxides of the elements PbO, BaO, CaO, CuO, ZnO and Ago were calculated using a sensitive balance. In the mixing and grinding phase, the constituent powders were combined under two different procedure: first mixing by hand in a mortar during a period of thirty minutes and second using an electric mixer with steel balls during another thirty minutes which ensured the development of smooth oxides and optimum homogeneity. The resulting compound oxides were then piled into cylindrical discs of a diameter of (1.5 cm)using a hydraulic press at a pressure of (7 tons / cm 2) minus two during a period of one minute. Axial pressure at both ends was provided in order to ensure maximum density achieved. Lastly, the discs were sintered under ambient atmospheric pressure in a convection oven at (800 ° C) and 48 hours. at a rate of (10 ° C/min) per minute. The critical temperatures were determined by using a protocol with four sensors after the samples had cooled down to ambient temperature with a controlled heating rate of 10O C min. The samples were even placed in the lowest possible temperature using liquid nitrogen and hence attained zero resistance, and high-quality critical temperatures. We opted to achieve coherent samples through the most desirable sintering temperature and electrostatic mixing time, thus, producing the most desirable samples of difficult to create compressed specimen samples [5].

Four sensors with temperatures ranging from 77 to 300 degrees are employed in the gadget to determine crucial temperatures. These sensors placed the sample inside the system at a pressure of 5 to 10 bar, cooled it with liquid nitrogen, and connected copper wires to the sample. The device was equipped to calculate critical temperatures using a 20 mA current and a continuous power source. Nuclear voltage was used to calculate samples, resistance, and A schematic of the apparatus used to determine the critical temperature is shown in Figure (1). [6]

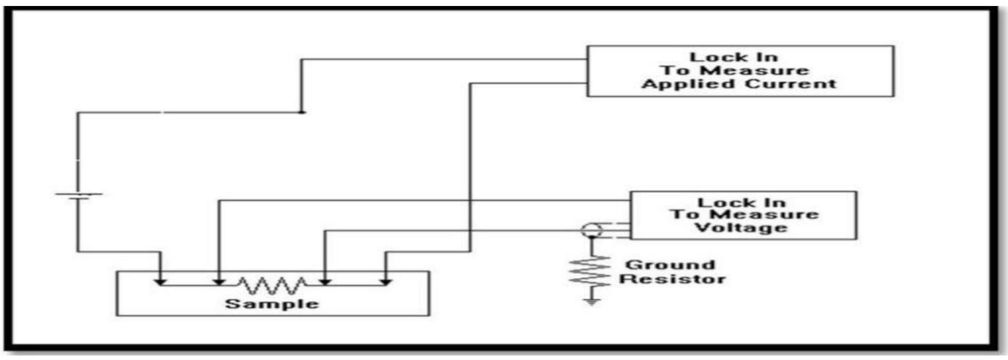
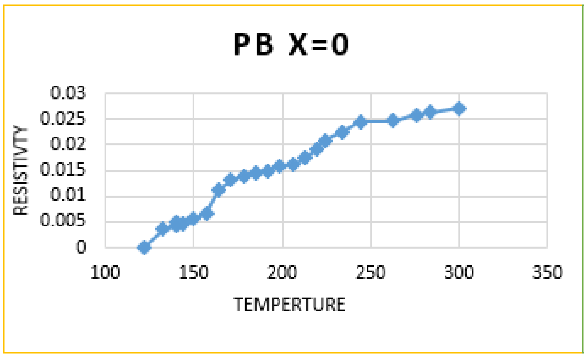


Figure (1) represents a diagram of the four sensors technology when calculating critical temperatures

4- Result and Discussion.

The critical temperatures were calculated based on the resistance of the specimens x=(0,0,1,0.2) in Figure (2-a,b,c). The results were displayed using the Excel program, and it was found that adding platinum oxide to a base of plomo had a significant and distinct increase in the critical temperature of transition, which is explained by the fact that adding platinum oxide with the formula (Pbx Ba2Ca2Cux ZnO8+δ) had a positive effect on obtaining a high critical temperature of transition, as well as a decrease in the ancho de transference ΔTc.



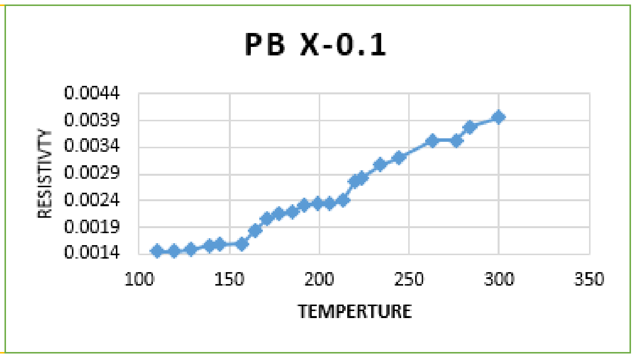


Figure (2-b) **Figure (2-a)**

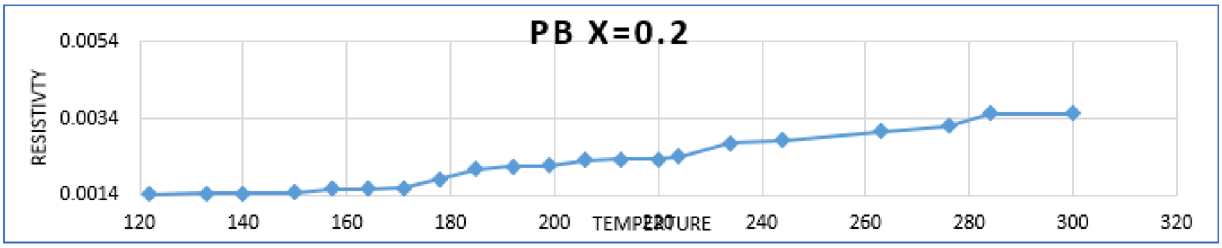


Figure (2-c)

figure (2-a, b, c) represent critical temperatures and resistivity at samples x= (0,0,1,0.2)

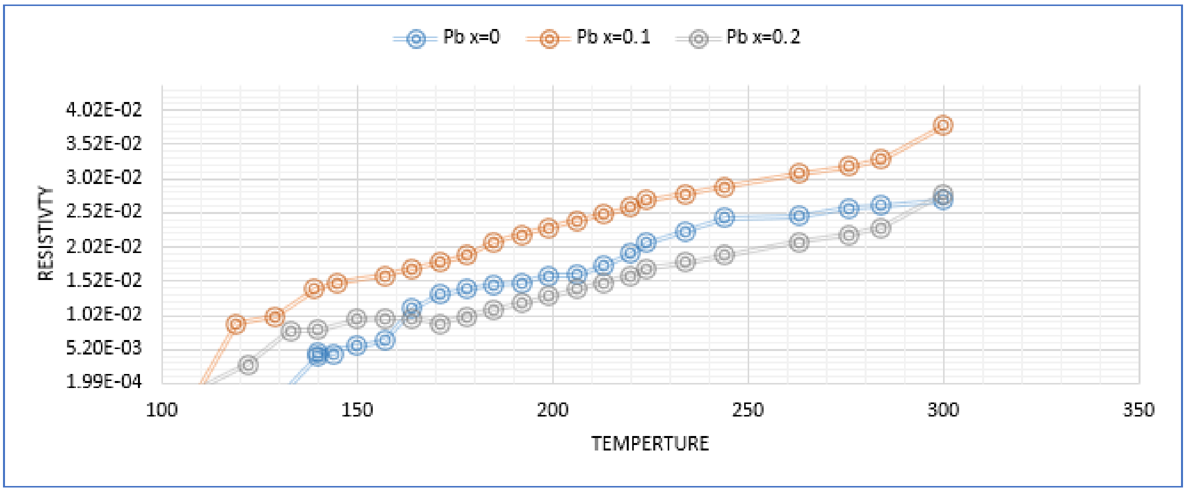


Figure (3) Shows electrical conductivity for critical temperatures and resistivity at all samples x= (0,0,1,0.2)

Figure (3) illustrates the change in electrical resistance as a function of temperature by combining relationships, and we find that the optimal temperature is Tc(offset) at x=0.1, where the critical temperature was Tc(of) of 126.7K. It is interesting to note that, even before the attainment of the critical temperature, the samples have the metallic behavior, which has been attributed to the presence of impurity and the low stages, and the resultant internal distortions in the crystal structure [7-10] and due to a change in the number of copper oxide capas and the addition of El óxido de plata aided in promoting access to appropriate critical temperatures [11]. Using Table

(1), we can see that the energy gap. The transition width was small to indicate the homogeneity of the sample, and we note the mean critical temperature was a maximum of 130.35 K at 0.1 at the sample.

Table 1. Shows sample ratios, initial and final critical temperatures, energy gap width and gap concentration of samples.

Sample	Tc(of)	Tc (on)	ΔT (K)	Tc(mid)(K)	Eg(ev)
X=0	122	130	8	126	0.04262
X=0.1	126.7	134	7.3	130.35	0.04184
X=0.2	121.1	130	8.9	125.55	0.04267

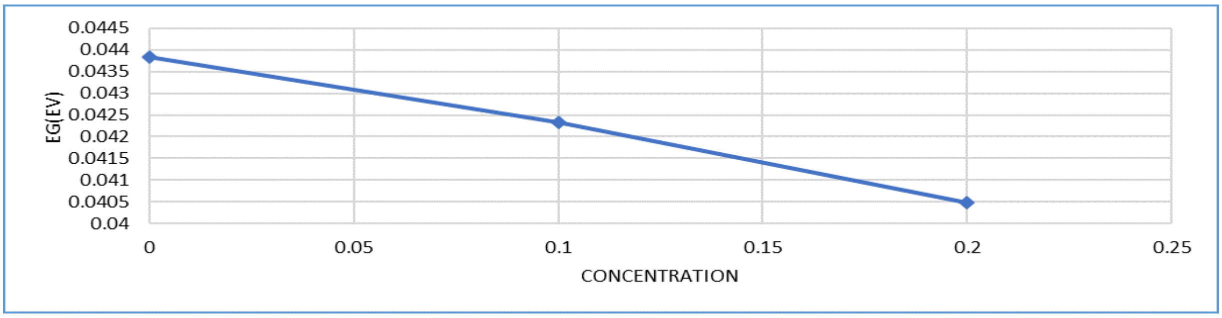


Figure (4) Shows Energy gap for samples x= (0,0,1,0.2)

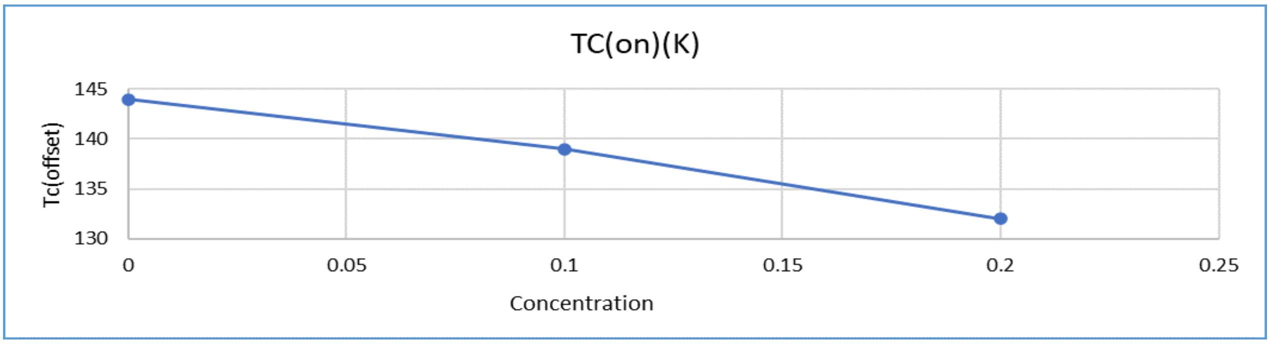


Figure (5) Shows Tc(offset) for samples x= (0,0,1,0.2)

Through Figures (4) and (5), we can observe that the initial critical temperatures rise as the proportions of samples increase, which is evident when the sample is 0.1. Additionally, we can see that the energy gap decreases as the proportions of samples increase, indicating an increase in sample homogeneity and obtaining optimal qualities to reach high critical temperatures[12-13].

5-Conculation.

According to our calculations, adding silver oxide to the compound (Pbx Ba2Ca2Cux ZnO8+δ) improves critical temperatures, transition width, and energy gap. The lower the energy gap, the more likely it is that an optimal critical temperature will be obtained, indicating that the sample is homogeneous and that the proportions of impurities are minimal. This is because the compound's copper oxide layers aid in the formation of Cooper pairs, which in turn results in optimal critical temperatures. and this The sample is 0.1, where we observe the critical temperature of 126.7K and the lowest energy gap. We also observe that the preparation conditions play a significant role in the compound's preparation and its effect on the properties of samples.

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