Volcanic materials superconductivity in desert areas of the states of Sonora and Baja California

To cite this article: Aldo Holguín 2017 J. Phys.: Conf. Ser. 792 012093

View the article online for updates and enhancements.
Volcanic materials superconductivity in desert areas of the states of Sonora and Baja California

Aldo Holguín
Profesor de la Universidad Estatal de Sonora
E-mail: aldoefrainh@yahoo.com.mx

Abstract. Research was conducted to find materials in their natural state at room temperature and exhibit the effects of superconductivity in the volcanic region of deserts Altar in Sonora and Baja California Norte. 100 were collected at random samples of materials from different parts of the region and underwent tests to determine their electromagnetic parameters of electrical resistance, magnetism, temperature and conductivity. Only it has been found that the effects of superconductivity in them is only present at very low temperatures corroborating what has been done in other investigations, however no indication that there is a material or combination of materials that can produce the effects of superconductivity other temperatures so it is suggested to continue the search for such materials and / or develop a technique at room temperature to allow mimic the behavior of atoms when superconductivity occurs at.

1. Introduction
A few years ago, even before the Industrial Revolution it was very difficult to talk about energy savings or wasteful consumption of it, because there were almost no different machinery we see today. The number of cars was just a small part of what is now, and fuel consumption cannot get used to compare with today. The energy was increased and with it pollution, is why natural processes such as the greenhouse effect and acid rain, hazardous agents today are involved in very harmful consequences such as global warming. So one of the priorities in energy policy in our country and in the rest of the world is to achieve the highest degree of efficiency in energy consumption.

Currently a polluted world increasingly large amounts of toxic waste, becomes indispensable search through a thorough reflection and analysis new alternatives, strategies and techniques whose help in this scenario geared to immediate action on the sustainable use of energy, dare generation and application of knowledge, which demands prompt the benefit of the environment. To do this project, concentrates the possibility of generation and application of reliable and valid knowledge through research practice, then then the opportunity to identify the different alternatives of superconductivity and magnetism, using the tools to generate new sightings, which accompanied by new techniques, help to fill gaps in terms of sustainability exist today, and consequently, reduce the pollution from the production of electricity.

Currently the use of electricity is essential for much of our activities; thanks to this type of energy we have a better quality of life, just by pressing buttons get light, heat, cold, picture or sound. Its use is
essential and we hardly stop to think about its importance and benefits to use it more efficiently. Saving electricity is a fundamental for the development of energy resources element; saving equivalent to reducing the consumption of fuels in electricity generation also avoiding the emission of polluting gases into the atmosphere.

Our country has a lot of energy sources. In Mexico, most of the generation of electricity is done through oil, coal and natural gas, significantly impacting the environment by relying on non-renewable resources such as fossil fuels. To use a lot of greenhouse gases, which are emitted into the atmosphere, causing global warming, whose effects are manifesting and are devastating.

Electrical energy is of great importance in the development of society, their use enables the production automation that increases productivity and improves in every way the living conditions of man. You need to save electricity, because this oil saving and currencies that can be invested in other branches of the economy, education, research and culture is saved. That is why measures for their savings are taken as the thermoelectric are our main source of electrical power, increasing electricity demand must increase the generation capacity of power plants, is why it is necessary to develop new technologies generation and one of these ways is using superconductivity [1].

Superconductivity is the property of some materials to lowering its temperature below its so-called critical temperature, abruptly stop resisting the passage of an electric current, thus forming a superconductor and to approximate a magnetic field presents a perfect diamagnetic phenomenon. By consistently have a considerable increase in electricity and likewise better control over the movements without mechanical friction [2].

2. Some History

If we take history that use the resistivity as a thermometric magnitude was what allowed it to be included in the various measures of various substances in a wide temperature range. In fact Dewar and Fleming since 1893 had indicated the possibility that the resistivity be annulled at absolute zero, although the measures taken subsequently on liquid hydrogen in which observed that the decline in this became smaller as down the temperature did suspect that it could remain finite at absolute zero. Interest Kammerlingh in measuring the electrical conductivity at low temperature was also stimulated by a suggestion Lord Kelvin (1902) that the resistivity should decrease with temperature, but below a certain value it should start increasing due to condensation of electrons [3]. This idea of electrons forming a susceptible gas be condensed, also could be suggested by theories Riecke (1898) and Drude (1900), who analyzed the phenomenon of electrical conductivity treating electrons as a gas obeys the equation state of ideal gases, thus being able to explain the old empirical Wiedemann Franz law which states that at the same temperature, the ratio of the thermal conductivity and electrical conductivity is the same for all metals. The first measures of resistance in the new temperature range carried for platinum showed that this apparently tends to a constant value against the expected behavior or approach zero by extrapolating the behavior at higher temperature or increase until it becomes infinite as Kelvin's suggestion Kammerlingh Onnes, who attributed the residual resistance to impurities in the metal and decided to repeat the experiments with two of the substances that can be put in the form of a thread with more high purity, gold and mercury. For gold, the results were similar as for platinum, but a striking change mercury was observed near 4.2 K, decreasing resistance abruptly from a finite value to zero. Repetition of the experiment allowed us to confirm that the phenomenon observed was similar to the behavior of platinum with a gradual decrease from the boiling point of hydrogen to helium boiling while around 4.2 K resistance quickly disappeared. These experiments were repeated in 1913 coining the publication of the first term superconductivity. Kammerlingh tried to explain the new phenomenon observed by using the theory of quanta of Planck, and subsequent discussions took place on the phenomenon in the Solvay conferences 1911 and 1912. Investigations of Leiden are interrupted until 1921 that the work is restarted this subject. However, Kammerlingh and elderly died in 1926 without the superconductivity phenomenon was explained, and his disciples, mainly Wilhem Keesom
(1876-1956) continued to work on the subject systematizing the study of the disappearance of superconductivity with the application of an external magnetic field and the thermodynamic treatment of the same as a phase transition [4]. However the next quantum leap in the interpretation of this phenomenon produced it in 1933 Fritz W. Meissner (1882-1974) when provided experimental evidence to the effect that the magnetic field vanishes inside the superconductor and therefore the transition a superconductor is a transition to a state of perfect diamagnetism (a is a diamagnetic substance for which an external applied field decreases inside) [5].

3. Materials and methods
100 samples of volcanic materials from different parts of the region were collected and subjected to tests to determine their electromagnetic parameters of electrical resistance, magnetism, temperature and conductivity. Because the objective of research to find superconductive materials at room temperature only were recorded for each of the samples the two main effects of superconductivity are the zero resistance to the passage of electric current and the diamagnetic effect it is to repel magnetic fields. This was done at room temperature and liquid nitrogen temperature, considering the sample as a superconductor when simultaneously present the two effects; electrical resistance that tends to zero and repels the magnetic fields [6].

4. Results
It was found that the effects of superconductivity in materials subjected to laboratory tests is only present at very low temperatures corroborating what has been done in other investigations

<table>
<thead>
<tr>
<th>Sample</th>
<th>Electrical resistance tends to zero</th>
<th>Diamagnetic</th>
<th>Superconductivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>From M1 to M100</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample</th>
<th>Electrical resistance tends to zero</th>
<th>Diamagnetic</th>
<th>Superconductivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>From M1 to M33</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>M34</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>From M35 to M68</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>M69</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>From M70 to M100</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

5. Discussion
In April 1986 the discovery of a new superconducting materials which were ceramic and presenting a temperature greater than any of the existing materials announced transition. As of this writing the critical temperature of superconducting transition highest reported is around 135K, well above the boiling point of liquid nitrogen, a refrigerant very economical price and easy to obtain. There are also promising signs that may perhaps achieve transition temperatures above 200K.
The discovery of this new type of superconductor was made by J. C. Bednorz and K. A. Müller in a research laboratory of the company IBM in Zurich, Switzerland. First, after over 12 years was possible to find a substance having a transition temperature above 23.3 Kelvin. In his research they read a scientific article that is key in their work. It was because French scientists C. Michel, L. Er-Rakho and B. Raveau, and he presented a new material whose characteristics of being a new metal oxide mixed valence copper made him ideal candidate to present superconductivity, according to the working hypothesis Bednorz and Müller. The composition of this material is BaLa4Cu5O13 · 4. Bednorz and Müller began to explore its properties by varying the concentration of Ba. In the spring of 1986 they published his article announcing superconductivity at a temperature of 35 Kelvin in this class of compounds. In these, the arrangement of the ions typically corresponds to a geometry known as perovskita and that is very common among so-called ferroelectric materials [7].

The rapid progress that has been achieved to find such materials with temperatures ever higher superconducting transition has been truly amazing. Very few scientific advances, if there have been any, have generated almost frantic flow of such scientific activity worldwide and at the same time, an immediate and very great among the general public interest. What the vast majority thought as impossible and is now something real and palpable: having superconductivity at higher temperatures than liquid nitrogen. The work of Bednorz and Müller earned them the Nobel Prize in Physics 1987.

Almost immediately after the announcement of the discovery of Bednorz and Müller, many groups of scientists in the world were launched to try to get higher transition temperatures. One of the most successful groups was that of Dr. Paul Chu of the University of Houston, one of the first to realize the importance of the discovery of Bednorz and Müller, who devoted himself to the investigation of these materials. They soon found that the critical temperature could be increased to 57 Kelvin applying pressure to the material. Both the magnitude of change in critical temperature, such that with increased pressure applied were abnormal when compared with the known superconductors before these new materials. With this in mind, Chu and his colleagues began looking for ways to simulate an "internal pressure" in these materials replacing the lanthanum (La) with similar ions, such as yttrium (Y). In late February 1987, Chu announced it had found a compound that had a higher transition temperature superconductor state of 90 Kelvin. The composition of this material is given by YBa2Cu3Ox. Almost simultaneously obtaining a material of similar composition and similar properties in China was announced. In a few days, with compositions that were variants reported by Chu and his collaborators, a dozen groups around the world reported on the production of ceramic superconductors with transition temperatures above 90 Kelvin, which have been prepared in the National Autonomous University of Mexico; how to synthesise is very simple and can be done with the technology that is available to the countries of the Third World.

It is very clear that having critical temperature superconductors above liquid nitrogen is a reality in our country and in many other third world nations. It also begins to be very clear that with them the world will not be the same. It is very likely that, once again, the physical change our way of living as happened with the advent of the electric motor, transistor, etc. [8].

It is worth noting that perovskitas copper and oxygen, the new superconducting materials had been studied, especially Raveau, Michel et al. Much of his work laid the foundation for achieving rapid progress immediately after the discovery of Bednorz and Müller. The initial interest in these materials settled in the high mobility of oxygen at elevated temperatures, which alters its electrical behavior, so that had been suggested as one of its possible applications, the oxygen sensor. Many studies have made it clear now that the superconducting properties of the compound of yttrium (Y), barium (Ba)
and copper (Cu) (very widely known as 1-2-3, its composition: YBa2Cu3Ox) depend critically on the amount and oxygen in the system, which in turn depends on the details of the process for obtaining it.

6. Conclusión
The effects of superconductivity until now only present in some materials and very low temperatures, however no indication that there is a material or combination of materials that can produce the effects of superconductivity at other temperatures so it is suggested to continue with the search for such materials and / or develop a technique at room temperature to allow mimic the behavior of atoms when superconductivity occurs at.

7. References