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Identify material types by magnetic properties

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Abstract: It is obvious that magnetic effects of materials depend on the existence of odd number of `electrons in their orbits. The materials exist in the odd electrons of orbits, their atoms show their effects in materials in spinal movement as magnetic, Furthermore ,the materials that have magnetic effects are divided into paramagnetic, Ferro magnetic and anti-Ferro magnetic, material which have pair electrons in their orbits don't have magnetics properties called dia magnetic.

Keywords: Ferro magnet, Para magnet , anti-Ferro magnet , dia magnet

I. INTRODUCTION

Introduction:

We know that every time a charged particle is in motion, in addition to the field of electric force, it also creates a field of magnetic force around it that is perpendicular to the direction of its motion. The magnetic properties of matter are explained by the fact that each substance is made up of atoms, molecules, ions as molecules, ions are composed of atoms and each electron is surrounded by a charged particle or around its axis. Rotation is the origin of the formation of magnetic properties, the presence of unique electrons (or an electron orbitals is the cause of the formation of magnetic properties), Therefore, determining the electron structure of atoms, molecules, ions, as well as the geometric structure of molecules, ions, and the chemistry of these structures plays an important role in understanding the electron and geometric structure of materials, the properties of electrons, and so on. The resulting magnetic properties are typically studied in groups that have one or more unique electrons (such as free radicals) based on the method of resonance Spin electron spectroscopy. It is important to note that the motion of the charged particles in the nucleus of an atom is not insignificant in the magnetic properties of atoms, molecules, and ions. Chemicals usually do not have a significant effect, so the magnetic properties of an atom or molecule are not taken into account when measuring them. Why doesn't this mean that nuclear magnets have no significant effect on chemical phenomena, Rather, the effects of such particles have made the identification of the magnetic resonance spectrum (NMR) a useful tool for chemists to study the properties and structure of materials. Let's look at some of the basic concepts of magnetism. Before we get into the basics of magnetism, we need to look at some of the basic concepts of magnetism. ref, 7, p.262.

Goals:

- Depending on what the magnetic properties are.
- Identification of different types of d-block metal compounds
- .

Procedure:

Authoritative books, articles on the subject and Internet sites have been used to write this article.

Preface:

The magnetic properties of materials depend on the number of electrons present in their orbitals.

Divided into Ferro, Para , anti-Ferro and dia magnet (atoms or molecules), in a ferromagnetic the particles form small groups or microscopic particles crystal Neither direction, there are different areas of crystals of this type of material. Not only are the electrons in each sphere of the crystal with non-parallel spins, but the orientation of their spines differs from each other in all spheres. In this magnetic material there are pairs of electrons in the orbitals of their atoms. These pairs of electrons neutralize the effects of Spin motion, so they do not show magnetic properties. Called Magneto chemistry, the magnetic properties of materials are currently used in technology, acoustics, geology and medical devices.

Para magnet material:

One of the characteristics of this type of material is that every time it is in a magnetic field, it is pulled towards that field and parallel to the lines of magnetic force, hence the line of magnetic force passing through itself. Brings them closer to each other and increase the density of the magnetic field. As a result, the magnetic field in them is much higher than in an empty space. Out of the field loses its magnetic properties. Ref. 1, p. 48.

Dia magnetic material:

This type of material is removed when exposed to an external magnetic field and tends to settle if it is perpendicular to the magnetic field. The lines of magnetic force move away from each other as they pass through. As a result, the density of the magnetic field decreases and therefore the magnetic field decreases.

Origin of Dia Magnet Properties:

The presence of diamagnetic properties depends on the presence of electrons formed in the orbitals. In this case the substance has no magnetic properties. If under the influence of an external field, the order of the electrons formed in the orbitals changes. Acts in the opposite direction. Therefore, the magnetism of the outer field is reduced by gases that do not have unique electrons, such as noble gases, hydrogen, fluorine, chlorine, nitrogen, sulfur dioxide, carbon monoxide, carbon dioxide molecules (and the same material as liquids and solids). Silicon, phosphorus, sulfur, arsenic, selenium, metals such as mercury, liquid or solid zinc, red gold, lead in solid state are considered ordinary dima magnetic materials. Increases with increasing such as beryllium, bore, diamond, silver, iodine, (solid) or decreases with increasing temperature such as graphite, copper, chromium, (at temperatures above 300 C^0). Ref. 8, p. 228.

Ferro magnetic material:

Ferromagnetic materials are materials that have properties similar to the magnetic properties of iron and the magnetism of them is higher than that of paramagnetic materials in karate, so they are of special value in industry and technology. Specimens are rare, such as natural iron magnetic oxide or magnetite (Fe_3O_4), iron family metals (iron, cobalt, and nickel) and some alloys. Dispersium and gadolinium differ in their ferromagnetic properties from paramagnets in that their magnetic properties remain outside the magnetic field as opposed to paramagnets and decrease dramatically with increasing temperature. Also a ferromagnetic property is a group or auxiliary phenomenon as opposed to a paramagnet belonging to a single particle (atoms or molecules) in which the particles form small groups or microscopic particles of crystal in each of which are oriented towards electrons and The vector of each component is like a small magnet, the spin of electrons outside the magnetic field, and consequently the magnetic axes are irregular in relation to these spheres in such a way that their effects are somewhat neutral. Ref. 7, P. 263.

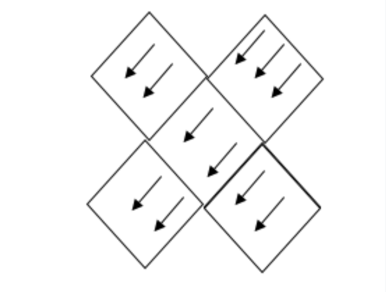


Figure: Position of grouped parts in ferromagnetic materials

Anti-Ferro magnetic material:

These substances exist in the form of crystalline solids, the samples of which are found in compounds of transitional elements. Such materials do not exhibit magnetic properties at normal temperatures but show paramagnetic properties with increasing temperature. Electrons are present in each sphere with non-parallel spins, with one sphere differing in Spin direction from the other sphere. Examples are as follows. Ref.5, P.238.

$$Ti_2O_3, VO_2, V_2O_3, Cr_2O_3, Mn_2O_3, Mn_3O_4, CoO, CoF_2$$

Anti-ferromagnetic source:

There are different areas of crystals of this type of material. Not only are the electrons in each sphere of the crystal with non-parallel spins, but the orientation of their spines varies from one sphere to another in such a way that the product in each sphere is different. Zero does not show any noticeable properties at normal temperature or low temperature. Another type of material is free magnetic objects, Orbitals have odd electrons. Why aren't the odd electrons in the adjacent crystals equal? Because the odd electrons of adjacent particles are not the same, so the spheres do not completely neutralize each other. It has magnetic properties such as $NiFe_2O_4$, $MnCr_2O_4$, $MnCr_2S_4$.It has low electrical conductivity and thermal losses are many times less than that of a ferromagnetic material. Ref. 7, P.264.

Measuring the magnetic field:

If the B body is placed between two poles of a magnetic field whose intensity is H.

The magnetic field between the body and the vacuum will be different from Gauss's law, which can be described as follows.

$$B= H+ H\Delta$$

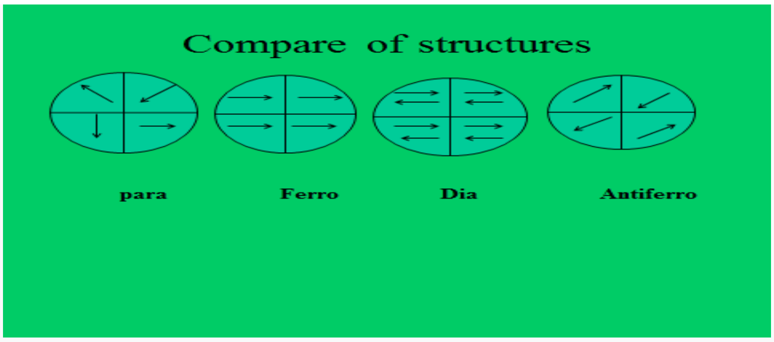
In the above formula, H is the magnitude of the magnetic field in space (or air), ΔH is the magnitude of the field created in the body by the effect of magnetic polarization. B is the body under test is the magnetic field intensity (magnetic induction intensity) of ΔH amount to π 4I so the above connection can be written as.

$$B= H+4\ I\pi$$

I is The force of a magnet is a magnetic moment in the unit volume of a body which shows the number of unique electrons in a unit volume of a body. B is called the magnetic field of acceptance, indicate by . so this connection can be written as follows. Ref. 6, P. 279.

$$\mu= 1+4\Pi k$$

The following figure shows a comparison of mercury, Ferro, Dia and anti-Ferro magnet materials.



Calculate the motion of the electron Spin($\vec{\mu s}$):

Since the spin moment is also derived from the circular motion of the electrons along the axis, (the angular orbital motion of the electrons can be used to calculate the moment μs.) And get the following link.

$$\mu s = \sqrt{S(S+1)(BM)}$$

Since the bohmer magneton is a small unit of magnetic motion, the correct multiplier of this motion may be equal to BM but the quantum number of electron spins is a fraction (1/2).

So the Spin motion of the magnetic electrons will be equal to 1/2 BM, which is not a logical reason. This coefficient is actually the magnetic moment (g) relative to the magnitude of the electron motion $g = \frac{\mu\vec{e}(B)}{mVr(h)}$at an angle g is equal to the exact quantity 2,00320 ± 4.10-6. However, the magnetic field of electro spinning is approximately equal to (2). In the case of an orbital magnetic moment, it is considered to be equal to (1). Ref. 3, P. 246.

$$\vec{\mu s} = g\sqrt{S(S+1)} = \sqrt{4S(S+1) \quad (BM)}$$

In the case of quadrants, instead of the quantum number S or I, we may apply the total quantum Spin number (S) and the total quantum orbital number (L) to the electrons, which can be written as follows.

$$\vec{\mu_L} = \sqrt{L(L+1)}(BM)$$

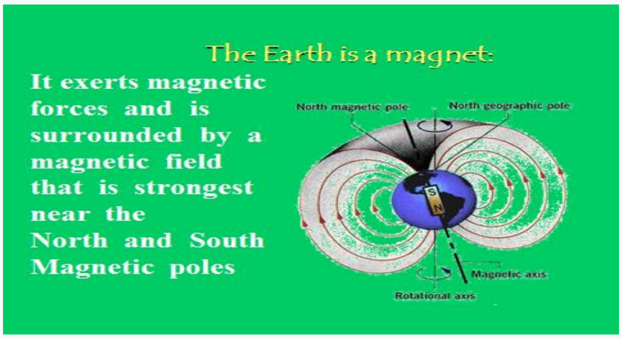
$$\vec{\mu_s} = \sqrt{4S(S+1)}(BM)$$

As the total amount of Spin quantum number is actually equal to half the amount of odd electrons S = n / 2. Ref. 6, P. 144.

$$\vec{\mu_s} = \sqrt{4X\frac{n}{2}(\frac{n}{2}+1)} = \sqrt{n(n+2)}(BM)$$

Earth Magnetism:

the earth's north must also be a magnet, and that the earth's crust must be the most natural magnetic field given its wide view. There is a strong magnetic body, which according to the principle of attraction and repulsion must be hung by a diurnal wire so that the north pole of the magnetic structure corresponds to the geographic south pole and its south pole to the geographic north pole. Magnetic field lines were then discovered to emerge from the Earth's North Magnetic Pole and enter the Earth's South Magnetic Pole. The Earth's magnetic poles do not correspond to its geographic poles. The compass should be considered when using it. The angle difference between the North Pole and the North Magnetic Pole, which is actually the South, is called Magnetic Declination and its value varies between zero and $25C^0$. It should be noted that the lines of the Earth's magnetic field are not perpendicular to the total point of the Earth. The angle at which the magnetic field B corresponds to the line of image that connects the earth's surface to the sky at any point on the earth is called the angle of dip.



The reason for the formation of the Earth's magnetism is that there are molten materials inside the Earth's crust that are in motion, most of which contain metals such as nickel and iron when these materials move. It creates weak electric currents around it that give a magnetic field to the earth as a whole that creates magnetic properties around the earth. We live on a very large magnet. Several other planets in the solar system also have magnetic properties, such as Para and Jupiter. This property is seen in the Sun and many other stars. The magnetic properties of the Earth's sphere play an important role in determining the direction of ships and planes. The Earth's north and south magnets are not fixed and change significantly over time. The magnetic properties of the material are also used in technical, audio and medical devices. Ref. 4, P.71.

Conclusion:

It was found that the magnetic properties of materials depend on the number of electrons present in their orbitals. Materials that have electrons in their orbitals have strong electrons. Divided into Ferro, mercury, anti-Ferro, and dia magnets. In paramagnetic materials their properties depend on a single particle (atoms or molecules). Each of the magnet materials has a different direction from the Spin of the electrons in each part, so there are different areas of crystal for this type of material. Not only do the electrons in each sphere of the crystal have parallel spins, but the direction of their spines differs from each other in all spheres. In this magnetic material there are pairs of electrons in the orbitals of their atoms. These pairs of electrons neutralize the effects of Spin motion, so they do not exhibit magnetic properties.

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