I'm not robot

reCAPTCHA

Continue

Electron affinity trend in period

Electron affinity is the affinity of an element with an electron. This is measured by the energy released when an element in its gaseous state accepts an electron to form an anion. So this is an exothermic reaction. They are expressed in KJ mol-1. M(g) - e– → M–(g) EA Since one, two or more electrons can be added to form an anion, many types of electron affinity are possible. The first electron affinity (EA1) is the energy released when the first electron is added to an element in a gaseous state. The second electron affinity (EA2) is the energy released when the second electron is added to the negatively charged element (M–) in its gaseous state. Subsequent electronic affinity is also possible for the negatively charged element in its gaseous state. M(g) - e– → M–(g) EA1 M–(g) - e– → M2-(g) EA2-(g) - e– → M3–(g) EA3 Order of subsequent electron affinity (EA2) is always larger than the first electron affinity (EA1) as it is difficult to add an electron to a negative atom. Such as the electron affinity of oxygen to add two electrons are: O(g) - e– → O–(g) EA1 - -142 Kj mol-1 O–(g) - and– → O2-(g) EA2 - 844 Kj mol-1 Here we can see that the second electron is much higher than the first. Thus, in general, the increase in the affinity of subsequent electrons increases by magnitude EA1<EA2<EA3 and so on. First electron affinity in the periodic table The first electronic affinity of the elements in the periodic table increases over the period and decreases the group. The first electron affinity increases over the period Moving from left to right in a period, the number of protons and electrons increases while the number of energy shells remains the same. Thus the affinity of an element (or more positive nucleus) to an electron increases over the period. The first affinity of electrons decreases downwards the group Moving down by a group, the number of energy shells also increases with the increase of protons and electrons. Thus, due to the shielding effects of electrons in increased inner shells, the affinity with a nucleus electron is reduced along the group. Fluoride is an exception According to the above discussion, fluoride should have more electron affinity than chlorine. But the electron affinity of fluorine is less than chlorine. Since fluorine is the smallest atom in this group, the entry of an electron results in greater repulsion due to the existence of electron clouds in the small shell. As a result, the affinity of electrons decreases in fluorine. F 1s22s2s2px22py22pz1 EA1 - -328 kJ mol-1 Cl 1s22s2p63s23px23py23pz1 EA1 - -349 kJ mol-1 Nitrogen is an exception has a very low electron affinity due to its semi-filled orbitals. Nitrogen is enough atom with respect to the adjacent carbon atom in the periodic table. So the electron the electron falls from carbon to nitrogen. C 1s22s22p2 EA1 - -122 kJ mol-1 N 1s22s2px12py12pz1 EA1 - 0.07 kJ mol-1 Summary Electronic affinity (EA) is the energy released to add an electron to an element in the gaseous state. In general, the increase in electron affinity of magnitude EA1<EA2<EA3, and so on. The earlier electron affinity increases in the period The first affinity of electrons decreases in the group Exceptions are nitrogen, fluorine, berino etc. 4.81/5 (16) Electron affinity is the energy associated with the addition of a voter to a gaseous atom. Example: Cl(g) - e- → Cl-(g) E.A. - -349 kJ/mol Notice the energy mark is negative. This is because energy is usually released in this process, as opposed to ionization energy, which requires energy. A more negative electron affinity corresponds to a greater attraction for an electron. (An unattached electron has zero energy.) Trends: As with ionization energy, there are two rules governing periodic trends in electron affinities: electron affinity becomes less negative in a group. As the main quantum number increases, the size of the orbital increases and the affinity for the electron is smaller. The change is small and there are many exceptions. Electron affinity decreases or increases over a period depending on the electronic configuration. This occurs because of the same subshell rule that governs ionization energies. Example: Because a semi-filled p subcondic is more stable, carbon has a greater affinity for an electron than nitrogen. Of course, halogens, which are an electron away from a noble configuration of gas electrons, have high affinities for electrons: (More negative energy - greater affinity) Element Electron Affinity I -295.2 kJ/mole Br -324.5 kJ/mole Cl -348.7 kJ/mole F -3 27.8 kJ/mole The electron affinity of Fluorine is smaller than that of chlorine due to electron repulsions - electrons higher in the smaller orbital of 2p than the larger orbital of 3p of chlorine. The electron affinity trend describes the trend through the periodic table and describes how much energy in an atom is released or spent when an electron is added to a neutral atom or the change in energy that occurs when an electron is added to a neutral atom. The electron affinity trend describes how the periodic table follows increases the affinity of electrons from left to right and how it usually decreases when moving down in a group of elements, from top to bottom. Although this is a brief description of the electron affinity trend, it would be useful to deepen the relationship between electron affinities and the periodic table. A On AtomsPhoto: Geralt via PixabayAtoms are made of three different parts: protons, neutrons and electrons. Protons and neutrons are located within the center of the atom, the nucleus of the atom. The nucleus of the atom contains almost the entire mass of the atom, the atom, both the neutrons and the protons that make up the atom have essentially the same mass (although the mass of the proton is slightly lower). Photo: Burlesonmatthew via Pixabay Protons in the atom are positively charged, and the number of protons found inside the nucleus basically defines what element an atom is. The number of protons within an atom is the atomic number of the element. The neutrons inside the atom have no charge, hence their neutrality. Neutrons are used as a point of comparison to find the mass of electrons and protons. We are protons and electrons/ residing in a nucleus. - AfeefaElectrons are about 1800 times smaller than neutrons or protons, and have a negative charge. Electrons orbit the nucleus of the atom, and orbit multiple layers known as shells. The outfielder layer of electron shells is known as the valence shell, and is usually the only layer that counts in chemistry. Electrons in the valence shell are known as valence electrons, and are the electrons most capable of binding to other atoms to create chemical bonds and molecules. Elements that have complete valence shells, such as noble gases, are stable and chemically non-reactive. Elements that have only one electron in their valence shell, such as alkali metals, or lack a single electron in the shell (such as halogens) are the most reactive elements. The reactivity and affinity of electrons are closely related, with the increase in the reactivity of an element as electron affinity increases. In other words, the greater the tendency of an element to gain electrons, the more responsive the element. Electron affinity Atom values can have a net positive charge or net negative charge. Positively charged atoms are called cations, while negatively charged ions are called ions. The energy of an atom can be acquired or lost through chemical reactions, so these chemical reactions form anions or cations. Ionization energies deal with the formation of positive ions, while electron affinities deal with the formation of negative ions. It is important to remember that, therefore, you will know that electron affinities deal exclusively with negative ions of atoms and that their use is almost always relegated to the elements within groups 16 and 17 of the table of elements. Protons are positive and electrons are negative, and of the two, I'm sure electrons are nicer. - Robert BenchleyThe electron affinity of an atom depends on when it is added to the atom. The initial addition of an electron to a neutral atom, the first electron affinity, will always have negative energy. This is because the energy is released when an electron is added to neutral atom. The ion is now negative, and more energy is needed when an electron is added to a negative ion. This means that the energy required overwhelms the energy and the energy by the electron attack process, and therefore the second electron affinity will be positive. Adding an electron to a metal element requires energy. This is because metals do not exert a strong shot on their valence electrons and are therefore losing electrons in the valence shell quite easily, becoming cations. For this reason, many metals have very low electron affinities. Photo: Geralt via PixabayElectron affinity are given in kj/mol (joules per mole), a measure of given energy per quantity of material. As an example of the fact that metals have a low electron affinity, examine the following electron affinity values for metals found in Group 1 of the periodic table:Lithium (Li) Electron Affinity: 60 KJ mol-1Sodium (Na) Electron Affinity: 53 KJ mol-1Rubidium (Rb) Electron affinity: 47 KJ mol-1Cesium (Cs) Electron affinity: 46 KJ mol-1Unlike metals, when a non-metal gains an electron, the amount of energy variation is usually negative. This is because nonmetals have enough energy to form negatively charged ions, ions. This means that the affinity value of nonmetal electrons is typically negative. Nonmetals have more electron affinity than metals because of their atomic structure. Nonmetals have more valence electrons, which makes it easier for them to get electrons and complete a set. The valence shell also tends to be closer to the core than to metals, which means that it is more difficult to remove electrons from nonmetals and easier for nonmetals to attract electrons to them. As an example of the higher electron affinity that nonmetals have, look at the electron affinity for halogens in the group 17:Fluorine (F) Electron affinity: -328 kJ mol-1Chlorine (Cl) Electron Affinity: -- 349 kJ mol-1Bromine (Br) Electron affinity: -324 kJ mol-1Iodine (I) Electron affinity: -295 kJ mol-1The electronic affinity trendThe trend of electron affinity, like other trends in the periodic table, reflects the fact that electron affinity follows a predictable trend while reading the periodic table. In this case, the affinity of electrons increases from top to bottom and from left to right. As you move from the bottom of the periodic table upwards through groups (columns) of elements, electron affinity tends to increase. Electron affinity also tends to increase when following the periodic table from left to right between periods (rows) in the table. Protons give an atom its identity, electrons its personality. Bill Bryson The greater the distance between the nucleus and the electron shells, the less attraction, the lower the energy released when an electron is introduced into the outer shell. Electron valence has an element, the more likely it is to gain electrons so that a full octet of electrons is form. The opposite trend also applies, the affinity of electrons decreases from right to left and down groups because the are located farther from the core and therefore have less attraction. The reason why the lower elements in the groups have no affinity of higher electrons despite their greater number of valence electrons is the shielding effect. The shielding effect increases as you descend a group, causing the electrons to push each other back more. Was this article helpful? It's good to hear that! Want more scientific trends? Subscribe to our science newsletter! We're sorry to hear that! We love feedback :-) and you want your input on how to make science trends even better. Better.