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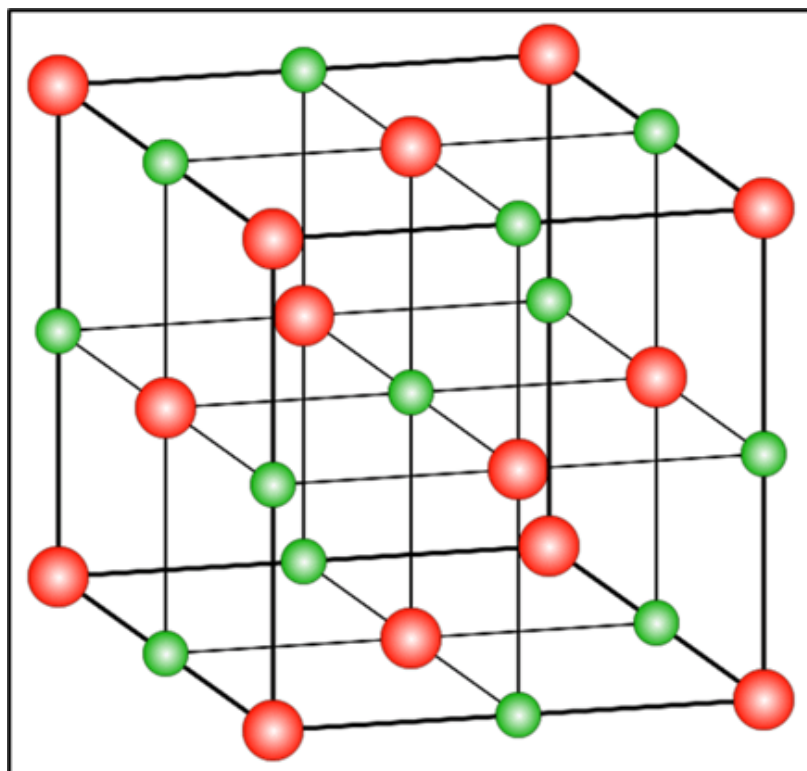
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Lattice Enthalpy of an Ionic Solid, Factors Affecting Lattice Enthalpy

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Lattice Enthalpy

- Ionic compounds have a strong molecular force of attraction and they are generally found in solid states. In these ionic solids, the molecules are arranged in a three-dimensional grid-like structure also known as a **lattice structure**.
- The amount of energy required to completely separate one mole of the solid ionic compound into constituent gaseous ions is known as **lattice enthalpy**.



lattice enthalpy structure

- Lattice enthalpy is a measure of the strength of an ionic compound. Whenever an atom loses an electron, it requires energy and whenever an atom gains an electron, it releases energy. Thus, the strength of an ionic compound depends upon the ease with which the positive and negative ions are formed from the respective neutral atoms. The ease of formation of positive and negative ions depends on the ionization enthalpy and electron affinity as below:
 - The formation of positive ions involves the removal of electrons. Whereas, ionization enthalpy is the amount of energy required to remove an electron from an atom. So, atoms with lower ionization potential (ionization enthalpy) will have higher lattice energy.

- The formation of negative ions involves the gain of an electron. As the electron gain enthalpy is defined as the amount of energy released when an electron is added to an atom, thus larger the electron affinity, more is the lattice energy.

Factors Affecting Lattice Enthalpy

Charge on the Ion

- The ions in the lattice crystal are attracted due to an electrostatic force of attraction present between them. Force is directly proportional to the magnitude of charge, hence higher the charge stronger is the lattice.
- For e. g. , Potassium Chloride and Calcium Chloride have the same crystal lattice arrangement but still lattice enthalpy of latter is greater than the former. This is because calcium ions have 2 + charges while potassium ions have only 1 + charge and as we know that electrostatic force of attraction is directly proportional to charge, so in the case of calcium chloride, this force is stronger.

Size of Atom

Smaller atoms have smaller interatomic distances and so have a stronger binding force. This results in higher lattice enthalpy. For example, if we go down in group 16 of the modern periodic table from fluoride to iodide, the lattice energy keeps on decreasing for their sodium salts.

Questions

What is Lattice Enthalpy of an Ionic Solid?

Answer:

- The amount of energy required to completely separate one mole of the solid ionic compound into constituent gaseous ions is known as lattice enthalpy.
- lattice enthalpy structure. Lattice enthalpy is a measure of the strength of an ionic compound.

What is the Enthalpy of Lattice Energy?

Answer:

- The lattice dissociation enthalpy is the enthalpy change needed to convert 1 mole of solid crystal into its scattered gaseous ions.
- Lattice dissociation enthalpies are always positive. The lattice formation enthalpy is the enthalpy change when 1 mole of solid crystal is formed from its separated gaseous ions.

Does the Lattice Energy of an Ionic Solid?

Answer:

- This model emphasizes two main factors that contribute to the lattice energy of an ionic solid: the charge on the ions, and the radius, or size, of the ions.
- The effect of those factors is: as the charge of the ions increases, the lattice energy increases. as the size of the ions increases, the lattice energy decreases.

What is Lattice Enthalpy Give Example?

Answer:

- It is defined as the heat of formation for ions of opposite charge in the gas phase to combine into an ionic solid.
- As an example, the lattice energy of sodium chloride, NaCl, is the energy released when gaseous Na^+ and Cl^- ions come together to form a lattice of alternating ions in the NaCl crystal.