

# Brittleness of ionic compound

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Ion - fixed in their place

Metallic - do not fixed in their place - electron free to move

The ions in the lattice structure follow a pattern positive and negative (in ionic compound the cation and anion is arranged in regular repeating structured)

Ion: Brittleness

Ionic solids are brittle. This is because the ionic bond are directional

- when a force is applied the same charge come together and same charge repel and therefore an ionic solid shatters into small pieces when a force is applied.

Ionic

- Ionic compound have high melting and boiling point, because the strong electrostatic attraction between the ion require more energy to break it.
- Electron difference
  - o As the electron is lose more, the negative/positive charge of ion increase, therefore the electrostatic attraction between them increase
- Size of ion(ionic radius)
  - o weaker charge density which ion do not held the electron as tight as smaller ion this result in the lower lattice energy so can be easier break apart. (this also happens to Isoelectronic - same electron left after transfer electron)- size(mass) of electron is different
  - o Because of this, smaller ionic have higher melting/boiling point
- Solubility-how easy something dissolve in solvent(water)
  - o Soluble in ionic or polar solvent because the ionic compound is separated by the polar solvent therefore dissolved
  - o Insoluble in non-polar solvent. - do not separated by the polar solvent
- Conductivity
  - o Conduct when dissolved - separate the individual ion anions free to move - conduct electricity(do conduct electricity in molten form as the ions is free moving)
  - o Conduct thermal (good when dissolved)- the free moving anions gain kinetic energy, move toward the particle have lower temperature, result in transfer of heat.
  - o Conduct thermal (bad when solid) - the particles are fixed in place whereas the thermal relies on the free moving particle to transfer heat, whereas the strong electrostatic attraction inhibit the electron move and held in their place

Eg: mg and Na is 2+, mg is stronger electrostatic attraction as the proton provide stronger charge

Polyatomic is an ion that is made up of more than one atom which together gained or lost an electron and therefore carried charge.

Lattice structure helps explain the physical properties of ionic compound (brittleness, conductivity)

Volatility - how easily a substance vaporized.

- Low volatility - high boiling/melting point
- High volatility - easier to evaporate

Metallic thermal conductivity(good)

- When heated, the delocalized electron gain kinetic energy
- The delocalized electron with higher kinetic energy move towards the particle in the lattice that has a lower

temperature.

Different metal has different strength of conductivity.

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Malleability - the metallic compound have good malleability because the electron are free to move around, when the force is exerted on it, the bond do not break, the nuclei shifts

In ionic lattice, the cation and anion is arranged in regular repeating pattern so whne the force exerted o it, the same charged ion come together, and same cahрге repel therefore the ionic solid broke.

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#### Ionic compound

- Melting and boiling point
  - o The elctronstatic attraction between cation and anion is strong, so it need more energy to separate them
- Charge of ion increase
  - o As the electron is lose more, the negative/positive charge of ion increase, therefore the electrostatic attraction between them increase
- Size
  - o There's lower density of charge in bigger ion, so they do not held the electron as tight as smaller ion, result in the lower lattice energy, therefore easier to break apart.
  - o In the case of isoelectronic - the xxx has bigger size so the density of charge is weaker which means the xxx element do not hold the electron as tight as the xxx element this leads to the lower lattice energy so it is easier to break apart.
- Solubility
  - o Ionic is soluble in water, because when the ion is in water, the polar watermolecule surround them and seperated them into individual ion due to opposite charge.
- Conductivity - (movement of charge particle)
  - o Conduct in water as the ion is seperated apart due to the polar water molecule, the negative charged ion is move in free and it is able to move around within electrical field.
  - o Do no conduct when ionic in solid because ions was fixed in place, which means there is no free moving charge particle
- Brittleness
  - o Bad brittleness, in ionic lattice, the cation and anion is arranged in regular repeating pattern, so when the force exerted on it, the same charge shift and come together, the same charge repel and eventually ionic solid shattered in to pieces.

Polyatomic ion is the ion that form by two or more atom, which together gained or lose electrons and therefore carried charge

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Volatility - how easy a substance vaporized

Metallic thermal conductivity (good)

- When heat, the delocalized electron gain kinetic energy
- The delocalized electron with high kinetic energy move toward the particle in the lattice that has a lower temperature

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