

Factors affecting Lattice Enthalpy and Hydration

Lattice enthalpy values depend on ionic size and ionic charge

Ionic size

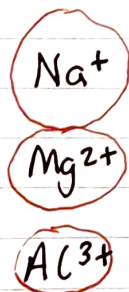
		$\Delta H_{\text{L}}^{\ominus}$	M.P.	Effect
NaCl	Increasing size of Cation	-786	801	<ul style="list-style-type: none"> • Ionic radius increases • attraction between ions decreases • Lattice energy less -ve • M.P decreases.
KCl		-715	771	
RbCl		-689	718	

Ionic size

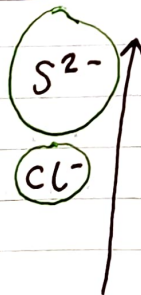
Lets compare Na_2O vs CaO (similar sized cations).

	charge	$\Delta H_{\text{L}}^{\ominus}$	M.P.	Effect
Na_2O	Na^+	-2455	1132	<ul style="list-style-type: none"> • Ionic charge increases • Attraction between ions increases • Lattice energy becomes more negative • Melting point increases.
CaO	Ca^{2+}	-3414	2900	

Effect of ionic charge and size across period 3



- Increasing charge so greater attraction.
- Decreasing size so more attraction.



- Increasing charge gives more attraction.
- Increasing size gives less attraction.

* Magnitude of lattice energy gives a good indication of m.p for ionic compounds. Those with very high m.p.s can be used for protective coatings in furnaces.

factors affecting hydration

Ionic size

	$\Delta H_{\text{hyd}}^{\ominus}$
Na^+	-406
K^+	-320
Rb^+	-296

Effect of Ionic size

- ionic radius increases
- attraction between ion and water molecules decreases
- hydration energy less negative

ionic charge

	$\Delta H_{\text{hyd}}^{\ominus}$
Na^+	-406
Ca^{2+}	-1579

Effect of Ionic size

- ionic charge increases
- attraction with water molecules increases
- hydration energy becomes more negative.

Predicting Solubility

- To dissolve an ionic compound in water, the attraction between the ions must be overcome.
- This requires the quantity of energy equal to the lattice enthalpy. So if the sum of the hydration enthalpies is larger than the lattice enthalpy then enthalpy of solution is negative and compound should dissolve.
- However some compounds with endothermic enthalpy of solutions also dissolve - so not the only factor, ~~also~~ entropy also a factor, along with temperature.