



14. Which one of the following alkaline earth metal sulphates has its hydration enthalpy greater than its lattice enthalpy?

(1) CaSO_4

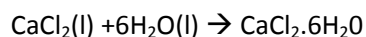
(2) BeSO_4

(3) BaSO_4

(4) SrSO_4

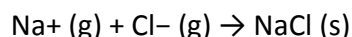
Answer: Hydration enthalpy: Also called Hydration energy is the amount of energy released when one mole of ions undergo hydration. It is a special case of dissolution energy, with the solvent being water.

For example, upon dissolving a salt in water, the outermost ions (those at the edge of the lattice) move away from the lattice and become covered with the neighbouring water molecules. If the hydration energy is equal to or greater than the lattice energy, then the salt is water-soluble. In salts for which the hydration energy is higher than the lattice energy, solvation occurs with a release of energy in the form of heat.



For instance, CaCl_2 (anhydrous calcium chloride) heats the water when dissolving. However, the hexahydrate, $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ cools the water upon dissolution. The latter happens because the hydration energy does not completely cover the lattice energy, and the remainder has to be taken from the water in order to compensate the energy loss.

Lattice enthalpy: The lattice energy of a crystalline solid is usually defined as the energy of formation of the crystal from infinitely-separated ions, molecules, or atoms, and as such is invariably negative. The concept of lattice energy was originally developed for rocksalt-structured and sphalerite-structured compounds like NaCl and ZnS , where the ions occupy high-symmetry crystal lattice sites. In the case of NaCl , the lattice energy is the energy released by the reaction



This value is equal to -786 kJ/mol

We know solubility in water for sulphate of group II metals decrease as we move from top to bottom. Hence BeSO_4 Hydration enthalpy is more than lattice enthalpy.

Correct option is (2) BeSO_4