

Answer on Question #76462 - Chemistry - Physical Chemistry

Question:

if Al^{3+} replaces Na^+ ions at the edge center of NaCl lattice THEN CALCULATE THE VACANCIES IN 1 MOLE OF NaCl

Solution:

Since there are 1 units of NaCl in each cell, there are 3 Na⁺ ions in the edge centers. So, 1 Al³⁺ will replace 3 Na⁺ ions. 3/4 moles of Na⁺ will be replaced by 1/4 mol Al³⁺ (for electrical neutrality), and the residual Na⁺ ions in the crystal are 1/4 moles. Therefore, in the crystal, 1/2 of the mole of the lattice sites will be occupied by 1/2 moles (1/4 moles of Al³⁺ + 1/4 moles of Na⁺) cations, so the vacant sites:

$$1/2 \text{ mol} = 1/2 * 6.02 * 10^{23} = 3.0125 * 10^{23}.$$

Answer: $3.0125 * 10^{23}$.

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