

## CHAPTER OVERVIEW

### 9: Ionic and Covalent Solids - Energetics

#### Learning Objectives

- Understand the geometric basis of radius ratio rules.
- Understand the chemical basis of structure maps and why they are better predictors of crystal structures than radius ratios.
- Use the Born-Mayer and Kapustinskii equations to calculate lattice energies of known and hypothetical compounds.
- Construct Born-Haber cycles using lattice energies and calculate unknown quantities in the cycles.
- Predict the stabilities of low and high oxidation states using lattice energies.
- Understand the quantum mechanical origin of the extra "resonance" stability of metals.
- Predict trends in the solubility and thermal stability of inorganic compounds using lattice energies.

In Chapter 8, we learned all about crystal structures of **ionic compounds**. A good question to ask is, *what makes a compound choose a particular structure?* In addressing this question, we will learn about the forces that hold crystals together and the relative energies of different structures. This will in turn help us understand in a more quantitative way some of the heuristic concepts we have learned about in earlier chapters, such as hard-soft acid-base theory.

[9.1: Ionic Radii and Radius Ratios](#)

[9.2: Structure Maps](#)

[9.3: Energetics of Crystalline Solids- The Ionic Model](#)

[9.4: Born-Haber Cycles for NaCl and Silver Halides](#)

[9.5: Kapustinskii Equation](#)

[9.6: Discovery of Noble Gas Compounds](#)

[9.7: Stabilization of High and Low Oxidation States](#)

[9.8: Alkalides and Electrides](#)

[9.9: Resonance Energy of Metals](#)

[9.10: Prelude to Ionic and Covalent Solids - Energetics](#)

[9.11: The Strange Case of the Alkali Oxides](#)

[9.12: Lattice Energies and Solubility](#)

[9.13: Discussion Questions](#)

[9.14: Problems](#)

[9.15: References](#)

---

This page titled [9: Ionic and Covalent Solids - Energetics](#) is shared under a [CC BY-SA 4.0](#) license and was authored, remixed, and/or curated by [Chemistry 310 \(Wikibook\)](#) via [source content](#) that was edited to the style and standards of the LibreTexts platform.