Report on the Evaluation of Chapter 19 The Nature of the Metallic Bond of Alkali Metals in "The Grand Unified Theory of Classical Physics" by Dr. Randell L. Mills

Prepared by

Randy A. Booker, Ph.D.
57 Azalea Drive
Weaverville, NC 28787
(828) 251-6269
Booker@unca.edu

July 8, 2019

Executive Summary

In my analysis, I verified calculations and equations involving the metallic bond of alkali metals (namely, Li, Na, K, Rb, and Cs) found in Chapter 19 of the book "The Grand Unified Theory of Classical Physics" by Dr. Randell L. Mills. I verified equations and values to a high degree of accuracy that are associated with these metallic systems. There is a remarkable agreement between the GUTCP calculated values for the energies, distances, and parameters of these systems and my calculations. I verified as correct all the equations and values found in Equations 19.1 through 19.68.

Purpose

In Chapter 19, the GUTCP book investigates the metallic bond of Li, Na, K, Rb, and Cs metals. The molar metal bond energy E_D and the lattice parameter a are found for each metal. These values are compared to known experimental values, and there is remarkable agreement between the two values for each alkali metal. Crystal structures for each of these alkali metals are also drawn.

Chapter 19 starts off with a discussion of the metallic bond. The method of images from Electromagnetic Theory is used. Alkali metal crystal structures are drawn. The dimensions of lengths of l_1, l_2, l_3, and l_4 are found in equation form. Also determined in equation form are θ_d and θ_p.

Next are diagrams of the crystal structure of the Li metal lattice where the electrons form two-dimensional membranes of zero-thickness. The kinetic energy and potential energy of this membrane are found. Next found is the lattice parameter a. And finally the molar metal bond energy E_D is found.

Next, the separation distance d between each M+ and the corresponding electron membrane is determined by a force balance equation.

d, a, and E_D are found for Li metal. The last two values compare well to experimental values.

There are diagrams of the unit cell of Li. And there are diagrams of the crystalline lattice of Li. And there are diagrams of the crystalline unit cells of M = Li, Na, K, Rb, and Cs.

d, a, and E_D are found for Na metal. The last two values compare well to experimental values.

d, a, and E_D are found for K metal. The last two values compare well to experimental values.

d, a, and E_D are found for Rb metal. The last two values compare well to experimental values.

d, a, and E_D are found for Cs metal. The last two values compare well to experimental values. The last four metals plus Li show that these results confirm that these metals comprise a precise packing of its ions.

Calculation

I have verified that Equations 19.1-19.10 are true.

I have verified that Equations 19.11-19.18 and their values are correct.

I have verified that Equations 19.19-19.26 are also correct.

I have verified that Equations 19.27-19.34 and their values are correct.

I have also verified that Equations 19.36, 19.38-19.41, and Equation 19.43 are correct. The value in Equation 19.43 is also correct.

I have verified that Equations 19.45-46, 19.48-19.50, and Equation 19.52 are true.

I have verified as correct Equations 19.54-56 and Equations 19.58-59. I have also verified the values as correct in Equations 19.54, 19.55, 19.58, and 19.59.

I have verified that Equations 19.60, 19.62, 19.63, 19.66, and 19.68 are correct. The equation and value found in Equation 19.64 are also correct.

Conclusion

I was able to verify that the GUTCP results of Chapter 19 are in excellent agreement with my own calculations. I successfully reproduced all of the equations and their corresponding values found in Chapter 19. That is, I have verified as all of the equations and the values they produce from Equation 19.1 to 19.68. This chapter demonstrates that the GUTCP theory is successful at describing the metallic bonds of Li, Na, K, Rb, and Cs to a high degree of accuracy.

I find my results and calculations to be confirmation that the calculations and equations of Chapter 19 are indeed accurate, valid, and reproducible.