

## Analytical description of critical properties of alkaline metals in the Li...Cs group and calculation of critical properties for francium

© Ivan K. Garkushin,\*<sup>+</sup> Olga V. Lavrentyeva, and Yana A. Andreeva

Department of General and Inorganic Chemistry. Samara State Technical University.

Molodogvardeyskaya St., 244. Samara, 443100. Samara Region. Russia.

Phone: +7 (846) 278-44-77. E-mail: gik49@yandex.ru

\*Supervising author; <sup>+</sup>Corresponding author

**Keywords:** critical parameters – temperature, pressure, volume, density, calculation, prediction, interrelation, graphic dependencies.

### Abstract

Of great importance under modern conditions is calculation methods, predicting and modeling the properties of elements, simple substances, compounds and mixtures of compounds in the groups, as well as the interrelationship of elements, simple substances and compounds with each other. This makes it possible to obtain the missing and interesting information about the properties. In this paper, analytical and graphical dependences of the critical properties (pressure, volume, temperature and density) of alkali metals depending on their order numbers are presented. All dependencies are represented by semi-logarithmic functions. Described by the Karapetyans' comparative method interrelation of critical properties: pressure–volume, pressure–temperature, volume – temperature. In addition to these interrelations, the critical properties are calculated by the Mendeleev's method. The relationship between the critical pressure-temperature and pressure-volume properties is described by the semilogarithmic equations, and the volume-temperature relationship by the logarithmic equation. Analysis of all methods shows that the descriptions of critical properties in the coordinates "property – the ordinal number of the s<sup>1</sup>-element" and the relationship "property 1 – property 2" by the Karapetyans' method are given comparatively consistent numerical values of the critical pressure and volume with a relatively smaller relative deviation than the calculation by the Mendeleev's method.

### References

- [1] G.I. Zamaldinova, S.N. Parfyonova, A.I. Garkushin, I.K. Garkushin, and V.V. Slepshkin. Properties of s<sup>1</sup>-elements, simple substances, halides and their mixtures: analytical description, calculation and interrelation. *Samara: Samara State Technical University*. **2010**. 202p. (russian)
- [2] I.K. Garkushin, N.A. Nikitina, and L.A. Medovschikova, and G.I. Zamaldinova. Calculation, prediction and interrelation of physical properties of simple substances and compounds of elements from IA, IIIA, VIIIB-groups in the periodic system. *Samara: Samara State Technical University*. **2003**. 92 p. (russian)
- [3] M. Kh. Karapetyans, S.I. Drakin. General and inorganic chemistry. *Moscow: Khimiya*. **1981**. 632p. (russian)
- [4] S.N. Parfyonova, I.K. Garkushin, and L.A. Medovschikova. Graph-analytical description and prediction of the properties of neutral atoms, simple substances of elements from IIA group in the periodic table. *Samara: Samara State Technical University*. **1999**. 96p. (russian)
- [5] S.N. Parfyonova, I.K. Garkushin, and L.A. Medovschikova. Analysis, prediction and interrelation of some physical chemical properties of the elements from IIA group in the periodic system. *Chemistry and Chemical Technology*. **1999**. Vol.42. No.6. P.129-132. (russian)
- [6] S.N. Parfyonova, I.K. Garkushin, L.A. Medovschikova. Properties analysis and prediction of the chlorides of the IIA group. Abstracts of the *X International Conf. «MKKhT - 96»*. *Moscow: Mendeleev University of Chemical Technology of Russia*. **1996**. P.129-162. (russian)
- [7] S.N. Parfyonova, I.K. Garkushin, and L.A. Medovschikova. Graph analytical description of the thermodynamic properties for the chlorides of the elements from the IIA group in the periodic system. *Chemistry and Chemical Technology*. **1999**. Vol.42. No.6. P.90-94. (russian)
- [8] P.I. Bistrov, D.N. Kagan, G.A. Krechetova, and E.E. Spielrein. Liquid metal heat carriers of heat pipes and power plants. *Moscow: Nauka*. **1988**. 263p. (russian)