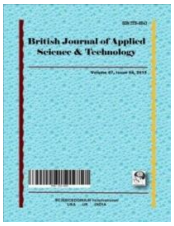

British Journal of Applied Science & Technology
8(2): 162-164, 2015, Article no.BJAST.2015.194
ISSN: 2231-0843

SCIENCEDOMAIN *international*
www.sciencedomain.org

Isotropy of Some Potassium, Sodium and Rubidium Compounds

Fae`q A. A. Radwan[1*]

[1]*Faculty of Engineering, Near East University, KKTC- Lefkosa, Mersin 10, Turkey.*

Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/BJAST/2015/12563
Editor(s):
(1) Mark Vimalan, Department of Physics, Syed Ammal Arts and Science College, India.
Reviewers:
(1) Anonymous, India.
(2) S. Sandy Subala, Chemistry, St. Joseph University in Tanzania- Arusha Campus, USA.
Complete Peer review History: http://www.sciencedomain.org/review-history.php?iid=1070&id=5&aid=8588

Original Research Article

Received 7th July 2014
Accepted 26th August 2014
Published 25th March 2015

ABSTRACT

The norm of elastic constant tensor and the norms of the irreducible parts of the elastic constants of potassium, Sodium and Rubidium compounds are calculated. The relation of the scalar parts norm and the other parts norms and the anisotropy of these compounds are presented. The norm ratios are used to study anisotropy of these compounds.

Keywords: Isotropy; norm; anisotropy; elastic constants.

1. INTRODUCTION

The decomposition procedure and the decomposition of elastic constant tensor is given in [1-6] also the definition of norm concept and the norm ratios and the relationship between the anisotropy and the norm ratios are given in [3-6]. As the ratio N_s/N becomes close to one the material becomes more isotropic, and as the ratio N_n/N becomes close to one the material becomes more anisotropic as explained in [3-6].

2. CALCULATIONS

By using Table 1 and the decomposition of the elastic constant tensor [1-6], we have calculated the norms and the norm ratios as shown in Table 2.

**Corresponding author: E-mail: faeq.radwan@neu.edu.tr, frdwnk@gmail.com;*

Table 1. Elastic constants (GPa), [7]

Cubic system, potassium compounds	c_{11}	c_{44}	c_{12}
Potassium cobalt flouride, $KCoF_3$	130	35.2	51
Potassium cyanide, KCN	19.4	1.45	12.0
Potassium magnesium flouride, $KMgF_3$	138	49.8	43.7
Potassium manganese flouride, $KMnF_3$	115.3	27.2	39.6
Potassium niobate, $KNbO_3$	255	90	80
Potassium nickel flouride, $KNiF_3$	158	40.3	48.5
Potassium tantalate, $KTaO_3$	431	109	130
Potassium zinc flouride, $KZnF_3$	134	38.1	53
Sodium bromate (piezoel), $NaBrO_3$	55.7	15.2	17.9
Sodium chlorate (piezoel), $NaClO_3$	49.6	11.6	14.7
Sodium cyanide, NaCN	22.7	0.35	12.6
Sodium thioantimonate (Schlippe's Salt) $Na_3SbS_4.9H_2O$,	23.91	6.69	14.73
Rubidium cadmium flouride, $RbCdF_3$	110	20.4	37
Rubidium cobalt flouride, $RbCoF_3$	130	41.5	55
Rubidium manganese flouride, $RbMnF_3$	117	31.9	42
Rubidium silver iodide, $RbAg_4I_5$	16.5	4.89	9.34

Table 2. The norms and norm ratios

Cubic system, potassium compounds	N_s	N_d	N_n	N	$\frac{N_s}{N}$	$\frac{N_d}{N}$	$\frac{N_n}{N}$
Potassium Niobate, $KNbO_3$	509.270	0	4.583	509.291	1.0000	0	0.0090
Potassium zinc Flouride, $KZnF_3$	272.732	0	4.399	272.767	0.9999	0	0.0161
Potassium magnesium Flouride, $KMgF_3$	270.480	0	6.324	270.554	0.9997	0	0.0234
Potassium cobalt flouride, $KCoF_3$	262.332	0	7.882	262.450	0.9995	0	0.0300
Potassium manganese flouride, $KMnF_3$	220.720	0	19.522	221.582	0.9961	0	0.0881
Potassium nickel flouride, $KNiF_3$	297.291	0	26.487	298.469	0.9961	0	0.0887
Potassium cyanide, KCN	44.094	0	4.124	44.287	0.9957	0	0.0931
Potassium tantalate, $KTaO_3$	806.852	0	76.071	810.430	0.9956	0	0.0939
Sodium bromate (piezoel), $NaBrO_3$	106.924	0	6.782	107.139	0.9980	0	0.0633
Sodium Thioantimonate (Schlippe's Salt) $Na_3SbS_4.9H_2O$,	56.787	0	3.849	56.918	0.9977	0	0.0676
Sodium chlorate (piezoel), $NaClO_3$	91.534	0	10.723	92.160	0.9932	0	0.1164
Sodium cyanide, NaCN	48.468	0	8.615	49.227	0.9846	0	0.1750
Rubidium cobalt Flouride, $RbCoF_3$	273.970	0	7.149	274.063	0.9997	0	0.0261
Rubidium manganese Flouride, $RbMnF_3$	230.699	0	10.265	230.927	0.9990	0	0.0445
Rubidium silver Iodide, $RbAg_4I_5$	38.0436	0	2.4013	38.119	0.9980	0	0.0630
Rubidium cadmium flouride, $RbCdF_3$	204.402	0	29.512	206.522	0.9897	0	0.1429

3. CONCLUSION

By examining the results which are given in table 2, we can say in general by considering the ratio $\frac{N_s}{N}$ that for potassium compounds, the compound Potassium Niobate, $KNbO_3$ is the most isotropic compound, and the most anisotropic compound is Potassium Tantalate. $KTaO_3$ because the value of $\frac{N_s}{N}$ is the smallest and the value of $\frac{N_n}{N}$ is the largest for Potassium Tantalate, $KTaO_3$, and for Sodium compounds the most isotropic compound is Sodium Bromate (piezoel), $NaBrO_3$, and the most anisotropic compound is Sodium Cyanide, NaCN because the value of $\frac{N_s}{N}$ is the smallest and value of $\frac{N_n}{N}$ is the largest for Sodium Cyanide, NaCN, and for Ribidium compounds, the compound Rubidium Cobalt Flouride, $RbCoF_3$, is the most isotropic compound and most anisotropic compound is Rubidium Cadmium Flouride, $RbCdF_3$ because the value of $\frac{N_s}{N}$ is the smallest and value of $\frac{N_n}{N}$ is the largest for Rubidium Cadmium Flouride, $RbCdF_3$. And we can say in general that the Potassium compounds are more isotropic than Ribidium compounds and Ribidium compounds are more isotropic than Sodium compounds. Also we can notice by considering the value of N that this value is the highest (810.430) in the case of the Potassium Tantalate, $KTaO_3$ compound so we can say that the compound Potassium Tantalate, $KTaO_3$ elastically is the strongest, and the in the case of Rubidium Silver Iodide, $RbAg_4I_5$ compound (38.119) the value of N is the smallest so we can say that the compound Rubidium Silver Iodide, $RbAg_4I_5$ elastically is the least strong compound.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Jerphagnon J, Chemla DS, Bonnevile R. The description of condensed matter using irreducible tensors. Adv. Phys. 1978;11: 1003-1017.
2. Radwan, Fae'q AA. Norm ratios and anisotropy degree. The First International Conference in Mathematical Sciences, Applied Mathematics, ICM99, November 1999, United Arab Emirates University, Al Ain, United Arab Emirates. Pak. J. Appl. Sci. 1999;1(3):301-304.
3. Radwan FAA. Scalar irreducible parts of sixth rank tensor. Arab Gulf Journal of Scientific Research. 2001;19(3):163-166.
4. Fae`q A. A. Radwan. Some properties of copper - gold and silver - gold alloys at different % of Gold. Journal: Lecture Notes in Engineering and Computer Science. 2011;2189(1):1221-1224.
5. Fae`q A. A. Radwan. Isotropy of some types of bones. International Journal of Engineering Science and Technology (IJEST). 2011;3(4):3382-3386.
6. Fae'q A. A. Radwan. Some properties of copper-nickel at different % of Ni', Pelagia Research Library, Der Chemica Sinica. 2014;5(1):34-38.
7. Landolt-Börnstein, Group III. Crystal and Solid State Physics. Springer-Verlag. 2001;11:163-166.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history.php?iid=1070&id=5&aid=8588