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Anisotropy of Lithium Compounds

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Abstract: The norm of elastic constant tensor and the norms of the irreducible parts of the elastic constants of Lithium compounds are calculated. The relation of the scalar parts norm and the other parts norms and the anisotropy of the material are presented. The norm ratios are used as a criterion to present the anisotropy degree of the properties of the material.

Keywords: Norm, Anisotropy, Elastic Constant, Irreducible and Molecular Mass

Introduction

Lithium Li is a metal, and the materials Hydrogen, Fluorine, Chlorine, Bromine, Iodine, and Deuterium, (H, F, Cl, Br, I, and D) are nonmetals. From these materials we have the following compounds, LiH, LiF, LiCl, LiBr, LiI, and LiD, (LiD Lithium Deuteride is a solid material which is in the Hydrogen Bombs). The decomposition of the elastic constant tensor to its irreducible parts and the norm concept and its relation to anisotropy are given in (Faeq, 2001).

Lithium Compounds:

The elastic constants of Lithium Compounds are given in the following table, (Landolt and Raymond Change, 1994).

By using table 1, the decomposition of the elastic constant tensor and the norm concept we can calculate the norms and the norm ratios of the given materials as in table 2.

Table 1: Elastic constants in $\left(10^{11}\, dyn/cm^2\right)$

Compound	C_{11}	C_{44}	C_{12}
Lithium Bromide, LiBr	3.94	1.91	1.89
Lithium Chloride, LiCl	4.91	2.48	2.20
Lithium Fluoride, LiF	11.20	6.35	4.60
Lithium Hybride, LiH	6.64	4.58	1.56
Lithium Deuteride, LiD	6.63	4.55	1.46
Lithium Iodide, LiI	2.85	1.35	1.40

Table 2: The norms and norm ratios (the anisotropy degree)

Compound	N_s	N_n	N	N_s / N	N_n / N	Molecular Mass
Lithium Iodide, LiI	6.725511	1.145644	6.822390	0.985800	0.167924	133.841
Lithium Bromide, LiBr	9.286059	1.622232	9.426693	0.985081	0.172089	86.841
Lithium Chloride, LiCl	11.48939	2.062159	11.67298	0.984272	0.176661	42.391
Lithium Fluoride, LiF	26.56400	5.590742	27.14594	0.978562	0.205951	25.941
Lithium Deuteride, LiD	15.71773	3.601904	16.12516	0.974733	0.223372	8.957
Lithium Hybride, LiH	15.84621	3.739382	16.28144	0.973268	0.229671	7.949

Conclusion

From table 2 we can conclude that Lithium Iodide LiI is the most isotropic material with highest value of N_s / N and lowest value of N_n / N, and Lithium Hybride, LiH is the most anisotropic material with highest value of N_n / N and with lowest value of N_s / N, because for isotropic material N_s / N = 1, and N_n / N = 0. Which means that as N_n / N increases the anisotropy increases. And also the strongest material is Lithium Fluoride, which has the highest value of N.

We conclude that there is a relation between a molecular mass and the isotropy of the material, the most isotropic material has the highest molecular mass. Also if we consider lattice energy we see that the most isotropic material has the lowest lattice energy.

References

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