Using the methods of group theory, we obtained parametric expressions for the laws of dispersion in a quadratic approximation of the resolution along components of the wave vector, the possible multiplicity of degeneration, and the zero slopes of the energy surfaces in the neighborhood of typical points of the Brillouin zone for crystals having a monoclinic lattice \( \Gamma_m^b \). The spin–orbital interaction and the operation of time reversal were considered.

1. Crystals of the monoclinic system having a Bravais lattice of the type \( \Gamma_m^b \) belong to five space groups: \( C_{2h} \), \( C_{4h} \), \( C_2 \), \( C_4 \), \( C_2 \).

The following substances and compounds are examples of monoclinic crystals having a base-centered lattice: CuO (space group \( C_{2h} \) [1]), Ag\(_2\)As\(_2\)S\(_4\) (space group \( C_{4h} \) [2]), and As\(_2\)Te\(_3\) (\( C_2 \) [2]) having semiconducting properties; dielectrics: muscovite KAl\(_2\)Si\(_3\)O\(_10\) (space group \( C_{2h} \) [1]) and gypsum CaSO\(_4\) \cdot 2H\(_2\)O (space group \( C_{2h} \) [1]), ZrF\(_4\), Fe(CO)\(_4\) graphite-like AI\(_2\)B, titanite CaTiSi\(_2\)O\(_6\) (space group \( C_{2h} \) [1]), FeKS\(_2\) (\( C_{4h} \) [2]), CuBr\(_2\), calaverite AuTe\(_2\), thortveite H\(_4\)Mg\(_5\)Si\(_2\)O\(_9\) (space group \( C_{2h} \) [1]), \( \alpha \)Bi\(_2\)Pd (\( C_{2h} \) [2]), AlCl (\( C_2 \) [1]), KNO\(_2\) (\( C_2 \) [1]), etc. As a rule, all organic crystals have a low symmetry. Chrysene C\(_{18}\)H\(_{12}\) (space group \( C_{2h} \) [3]), polypropylene isotactic (space group \( C_{2h} \) [4]) and (COOK)\(_2\) \cdot H\(_2\)O (space group \( C_{2h} \) [1]) have the \( \Gamma_m^b \) structure.

The interest in such low-symmetry structures is associated not only with the requirements of technology but also with the problems of investigation of the properties of deformed semiconductors. Actually, the symmetry of the crystal lattice is preserved only in the case of deformations of uniform compression or tension which can be described by introducing a scale factor which depends on the deformation. A deformation of more complex type leads to a lowering of the lattice symmetry. Thus, low-symmetry lattices can be considered as deformed symmetric structures. From this point of view, the monoclinic lattice \( \Gamma_m^b \) is particularly interesting because it can be obtained as a result of a continuous infinitesimal deformation of all the different orthorhombic lattices (\( \Gamma_0^y, \Gamma_0^f, \Gamma_0^b \)). The Brillouin zone of such a lattice was obtained by [5] for all the possible relations between the parameters.

2. The laws of dispersion were calculated for the local system of coordinates having its center at the point of symmetry considered: the axes \( x, y, z \) of this system were oriented parallel to the axes \( \kappa_x\kappa_y\kappa_z \). The coordinates of the points of symmetry were determined by means of the resolution coefficients of the wave vector \( \kappa \) along the reciprocal lattice vectors \( \kappa = \mu_1b_1 + \mu_2b_2 + \mu_3b_3 \).

The selection of the points of symmetry \( \kappa \), their numbering and expression by means of the vector \( b_i \) of the reciprocal lattice (with the exception of the vectors \( \kappa_{11} - \kappa_{12} \)), and also the symmetry groups \( G_k \) at these points for the class \( C_{2h} \) correspond to the data of Kovalev [6]. The groups \( G_k \) for the classes \( C_2 \) and \( C_{4h} \) were determined as the intersection of the group \( G_k \) of the class \( C_{2h} \) with the groups \( C_2 \) and \( C_{4h} \) respectively. The loading conditions which determine the type of nonequivalent irreducible corepresentatives at the points of symmetry were calculated according to [7] using the data of [6].

The typical vectors have the following form (see Fig. 2-5 [5]):
3. The parametric expressions for the laws of dispersion in a quadratic approximation of the resolution into components of the wave vector for the case where spin–orbital interaction is not considered are shown in Fig. 1. Here x, y, z are the components of the vector κ of the local system of coordinates having its center at the point considered.

\[ K = A x^2 + B y^2 + C z^2, \quad S = D x y + E y z + F z x, \]

in which case for the group \( C_{2h} \), we have \( Q = R = 0, \)

\[ R(G) = \sum_{i=1}^{3} (a_i x + b_i y + c_i z)^2, \]

in which case for the group \( C_{4h} \), we have \( a_3 = b_3 = F_3 = E_3 = 0. \) All the parameters occurring in the laws of dispersion are real.

It is seen from Fig. 1 that the laws of dispersion obtained without considering the spin–orbital interaction have a simple form. In these we can distinguish the part \( U = K + D x y \) which is invariant during the transition from one class to another and the variable part whose form is determined by the characteristics of the space group.

It is easily seen that in the laws of dispersion (Fig. 1), there are no characteristics of the type of loops and surfaces of extrema.

The laws of dispersion vary at the points 0, 1, 7, if we consider the spin–orbital interaction. These are shown in Fig. 2. Here K and S have the same sense as in Fig. 1.

\[ L = \sum_{i=1}^{3} (a_i x + b_i y + c_i z)^2, \quad \varphi(G) = c^2 z^2 + (a x + b y)^2 + (l x + m y)^2, \]

in which case for the class \( C_{2h} \), we have \( l = m = 0, \)

\[ \varphi(G) = c^2 z^2 + \sum_{i=1}^{3} (a_i x + b_i y)^2 + z^2 (F x + E y)^2, \]

in which case for the group \( C_{4h} \), we have \( c = F = E = 0. \)