STACKING FAULTS IN HEXAGONAL ZnS RODS
AND NEEDLES

By
E. LENDVAY and P. KOVÁCS

RESEARCH INSTITUTE FOR TECHNICAL PHYSICS OF THE HUNGARIAN ACADEMY OF SCIENCES,
BUDAPEST

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The present paper deals with the investigation of stacking faults in hexagonal ZnS rods and needles. Some possible models are presented for dislocations in wurtzite lattice and the formation of certain crystal-regions without striations and birefrigence bands. The description of the macro- and microlamellar structure in ZnS, appearing in the direction perpendicular to the c-axis is given.

1. Introduction

Interest in ZnS crystals is centred mainly on their luminescent and photoconductive properties. Nowadays both microcrystalline ZnS and single crystals are studied, but it must be noted that the basic research has shifted from microcrystals to that of single crystals of ZnS. This is in close connection with the fact that part of the phenomena appearing in ZnS, — especially electroluminescence — show a strong anisotropy in different crystallographical directions.

Natural cubic (F 43 m) and hexagonal (C 5 mc) ZnS crystals are generally almost perfect structurally but they often contain impurities in rather high concentration, (appr. 5—10%) so that the luminescent and semiconductive properties of the material are completely killed. Several methods have been described for the preparation of artificial ZnS crystals (see e.g. [1, 2]). The chemical purity of these synthetic crystals is generally sufficient but their structural qualities are worse than those of natural crystals. The synthetic crystals often have a polytype character containing a mixture of three-layer (cubic) and two-layer (hexagonal) modifications.

The study of the structure “purity” of ZnS crystals in luminescent research is as important as that of chemical purity. A number of phenomena indicates that besides point defects other imperfections have also a decisive role especially in electroluminescence. One of these phenomena is the (1010)-oriented lighting lines on the basal plane of ZnS rods [3, 4]. A similar localized character appears in the photovoltage and photoconduction effects, etc.

In this paper we shall deal with the stacking faults in hexagonal rods and needles. They are the most common type of faults in ZnS, therefore they have a decisive role in the physical properties of the material.
2. Stacking faults in ZnS rods and needles

The crystals examined were prepared in our laboratory. Some remarks in connection with this work are already discussed in a previous paper [5]. In [5] the question of flux has already been mentioned. Very good results were obtained with SrCl₂, but a great quantity of Sr was built into the ZnS lattice. The study of electroluminescence requires high purity, therefore we use HCl as flux at present. With this method we succeeded to produce rather pure crystals of sufficient size emitting the blue band characteristic of selfactivated ZnS excited with the 365 nm Hg line.

Fig. 1. Adjacently developed hexagonal ZnS rods. The crystals have nearly perfect basal planes

Fig. 2. Birefringence bands on habit faces of ZnS needles in polarized light. a — crystal with high band density, b — needle with only few birefringence bands