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On the Optical Absorption Edge in the $CdInGaS_4$ Layered Compound at Low Temperatures

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Introduction Several papers have been published recently concerning structural, optical, and electrical properties of the $CdInCaS_4$ layered compound. This compound is a member of the $A^{II}B^{III}_2C^{VI}_4$ family with very interesting physical properties /1/. The interest in this material, which had been first synthesized in 1970 by Shand /2/, originates from its important photoelectrical properties which make it a good candidate for applications in semiconducting devices (light emitting devices, photoconductivity, etc.).

$CdInGaS_4$ crystallizes in the rhombohedral structure with space group C^5_{3v}(R3m) /2, 3/, although there are works which propose diferent space groups as D^1_{3d} /4/, C^1_{3v} /5/, and C^2_{3v} /6/. After detailed investigations by electron microscopy /7/ it was found that the structure of $CdInGaS_4$ is identical with that of the $ZnIn_2S_4$(III) polytypic form, as suggested also by Shand /8/. The lattice parameters in hexagonal description are a = 0.3858 nm and c = 3.702 nm. We shall see that our absorption edge investigations are compatible with the similarity of the two structures.

In the present note we report on the temperature dependence of the fundamental energy gap of $CdInGaS_4$ in the temperature range from 90 to 450 K determined by absorption measurements. In the literature there are published data on the energy gap at several temperatures and there seems to exist a controversy about the predominant contributions in the absorption spectra and their origin. Some papers report indirect transitions /9 to 11, 15/ and others direct /2, 12, 13/ as predominant ones. As far as we know, there has not been a detailed investigation of the absorption edge of $CdInGaS_4$ at various

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