

GaAsO₄ in the quartz forms and the GaSbO₄ rutile form are shown in Fig. 3. The following generalizations are made on the basis of these and other spectra:

1. When there is a change of primary coordination of the cation it is clearly reflected in the main stretching frequency. Moreover, the

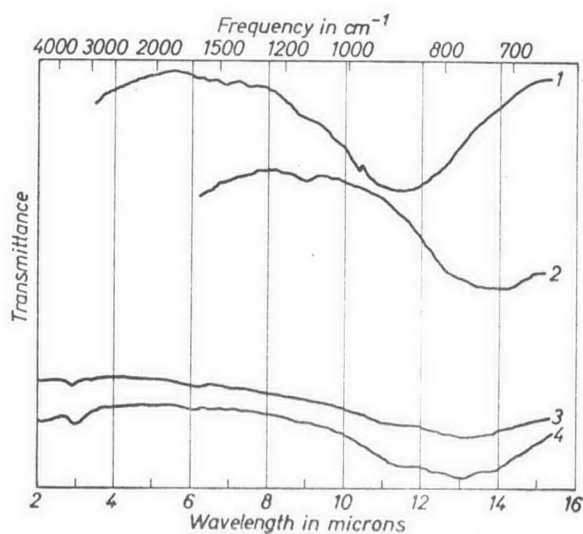


Fig. 1. Infra-red absorption spectra in the 2–15.5 micron region. 1. GeO₂ quartz; 2. GeO₂ rutile; 3. BeF₂ quartz; 4. BeF₂ coesite. (Sample preparation—KBr window, 1–1.5 mg sample in 0.3 g KBr.)

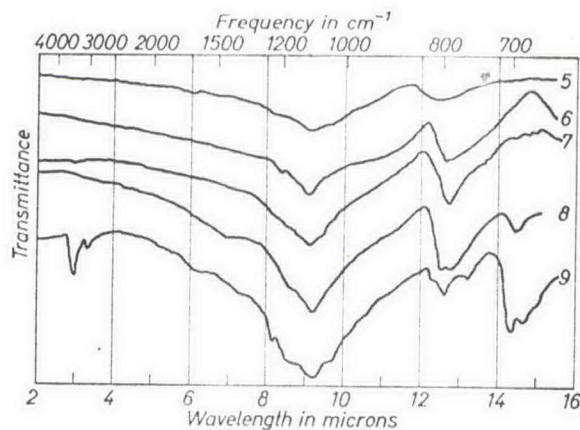


Fig. 2. Infra-red absorption spectra in the 2–15.5 micron region. 5. SiO₂ glass (vitreous); 6. SiO₂ cristobalite; 7. SiO₂ tridymite; 8. SiO₂ quartz; 9. SiO₂ coesite.

ratio of the squares of the w from four to six coordination mere numerical coincidence of connection between the effect and hence on the force constant, cannot be adequately checked until more examples are at hand.

2. The effect of even major changes in secondary coordination (BUERGER's terminology) does not affect the *main* cation-anion stretching absorption band. Thus the patterns of cristobalite, tridymite, quartz and coesite are very similar although there is a 25 per cent volume spread. The coordination of Si⁴⁺ is therefore four in coesite although there may be a greater variety of Si—O distances in coesite than in quartz as indicated by the structure in the main Si—O band. The BeF₂ polymorphs bear out this hypothesis very well (Fig. 1). Hence the increase in density in going from quartz to coesite is realized only by a new packing of tetrahedra and not by increased coordination.

3. The effect of mass on decades in molecular spectra absorption spectra published

³ F. A. MILLER and C. H. W. frequencies of inorganic ions. *Ann. N. Y. Acad. Sci.* 111, 6