CRYSTALLOGRAPHY OF CRISTOBALITE FROM ELLORA CAVES, INDIA

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Thirteen simple octahedral crystals of low cristobalite from Ellora Caves were measured, giving readings for 52 separate octahedral faces. The average rho angle for all readings was 54°42′. The closeness of this average reading to the calculated octahedral angle of 54°44′ is surprising since none of the faces gave satisfactory reflections. The rho values ranged from 52°01′ to 56°53′, although most were within one degree of the average. The readings for the phi azimuthal angle varied from 87°11′ to 93°07′. The calculated angle is 90°00′.

Although the crystals appeared perfect, etching was seen under the binocular microscope. Not one of the measured 52 faces gave clear, single signals on the goniometer. Signals for each face varied from two to four in number and were generally indistinct. Orientation of the crystals was consequently difficult. The light was not reflected from each face as a unit but generally from small triangular regions along one of the edges of the face. The lines bordering these reflecting spots were always parallel to the edges of the face. The reflections were studied carefully to determine whether any systematic departure from isometric symmetry could be discovered, but none could be noted. It was impossible to determine whether the poor reflections were the result of etching or of distortion due to inversion, although the latter seems more likely.

Considering the poor quality of the reflections, the angular values discovered for these cristobalites were not sufficiently critical to fix the symmetry or to even suggest that any symmetry other than isometric is probable.

Twinning

At least 50 per cent of the cristobalites showed penetration twins on the simple octahedral law. The apparent perfection of the twinning was not confirmed very well by the measurements. Four twinned crystals were measured and plotted on a stereographic diagram. Each plot was superimposed over a diagram with the face poles in their calculated positions. Although perfect identity was never realized, the deviations were not great, nor were they systematic in character. That twinning occurred when the crystals were at a higher temperature and were truly isometric seems clear.

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Quartz Paramorphs after Cristobalite

Seven crystals which had been separated as quartz paramorphs after cristobalite by Van Valkenburg were measured, and similar results to those for low cristobalite were obtained. The only difference that could be noted was a general deterioration of the quality of the signals in the quartz paramorphs. The angular relationships of both the simple and twinned crystals seemed entirely comparable to those for low cristobalite. Instead of isolated areas reflecting imperfect signals as in low cristobalite, each face of the paramorphs gave one large, diffused light reflection with no concentration of light in any part of the signal. This fact seems to indicate that continued inversion from high cristobalite to quartz produced such distortion of the lattice that the formerly perfect faces became highly irregular.