08.4-16 THE CRYSTAL STRUCTURE OF BEUDANTITE, $PbFe_3[(As,S)O_4]_2(OH)_6$. Jan T. Szymański, Mineral Sciences Laboratories, CANMET, E.M.R., 555 Booth Street, Ottawa, Ontario, Canada, K1A 0G1

The structure of beudantite from Tsumeb, Namibia, has been determined and refined to a residual R=3.9% from 644 unique reflections obtained by averaging the whole Mo$K\alpha$ sphere to 2θ=80°. The data were initially averaged in space group $R3m$, keeping Friedel pairs and their equivalents apart (1282 refl.), but refinement showed the structure to be centrosymmetric, $R\bar{3}m$, a=7.3151(9), c=17.0355(5)Å. There is no evidence of a cell doubled in c as occurs in plumbojarosite[1]. The structure is disordered in two ways: there is complete disorder between As and S atoms in the two (As,S) sites, when the structure is refined in $R3m$, leading to identical scattering power and identical bond lengths to neighbouring oxygens. When refined in $R\bar{3}m$, the bond lengths are between the expected As-O and S-O tetrahedral values. A second, most unusual type of disorder, is shown in the Pb position. In normal alunite/jarosite structures, this cation is at the origin, but in beudantite, its position is about 0.28Å from the origin, and along x. Thus with the equivalent positions of this Pb atom, the electron density appears as a torroid of radius 0.28Å in the x-y plane, centred on the origin, and surrounded by a cage of 12 oxygen atoms. The bond lengths from Pb to the oxygens vary between 2.64 and 3.10Å, these being shorter (in the minimum) and longer (in the maximum) than the corresponding distances in plumbojarosite.

1: Szymański, Jan T. (1985): *Can. Mineral.*, 23, 659-668.

08.4-17 ORIENTED TRANSFORMATION OF AZURITE INTO TENORITE. By R. Guha, Mineral Physics Division, Geological Survey of India, and D.R. Dasgupta, Department of Geology, Jadavpur University, Calcutta.

The transformation of azurite, $Cu_3(OH)_2(CO_3)_2$, during thermal treatment has been studied by X-ray diffraction, differential thermal analysis and thermogravimetric methods. Azurite transformed partially into tenorite when heated at 250°C for about 2 h, and completely on further heating at 400°C for 4 h. During the process, CO_2 and H_2O were completely removed from the structure, and cupric and oxide ions were readjusted. The orientational relationship between the two phases has been elucidated.

08.4-18 APPLICATION OF TRANSMISSION ELECTRON MICROSCOPY TO THE STUDIES OF TRANSFORMATION OF MINERALS. By N. Morimoto and M. Kitamura, Department of Geology and Mineralogy, Kyoto University, Kyoto, 606 Japan.

One of the main purposes of mineralogy is to elucidate the geological history which the minerals experienced. To attain this purpose, the information on the chemical compositions, crystal structures, microtextures and occurrences of minerals are indispensable. Because the minerals usually keep the traces of decomposition and exsolution as microtextures, the study of the microtextures and their chemical inhomogeneity is necessary for deriving the information on the parameters describing the geological history of the minerals. In the course of the study of the microtextures of minerals, it has become increasingly evident that the textures of the scale of 10-100 nm are specially important for elucidation of the cooling history of minerals and transformation kinetics which the minerals experienced. In the last ten years, the high resolution transmission electron microscope with the analytical mode, or analytical transmission electron microscope (ATEM) has been proved to be a very capable instrument to investigate the microtextures, and chemical inhomogeneity of the microtextures in minerals. In order to investigate the transformation kinetics of minerals, in-situ observation under the electron microscope at high temperature is also necessary. A heating stage up to 1300°C for the transmission electron microscope has been developed. This high temperature TEM(HTTEM) were used. In this review, the investigations of the rock-forming minerals,such as feldspars,pyroxenes and olivines by ATEM and HTTEM, most of which have been carried out in our institute, are given.