15. UTILIZATION OF SYNCHROTRON RADIATION

15.1-01 X-RAY POWDER DIFFRACTION STUDIES USING SYNCHROTRON AND CONVENTIONAL RADIATION SOURCES. By P. Thompson and A.M. Glazer, Clarendon Laboratory, Parks Road, Oxford OX1 3PU.

Pilot studies of X-ray powder diffraction experiments using synchrotron radiation will be described. These indicate that very high resolution can be achieved with relative ease, and in addition very rapid exposures are possible.

A general-purpose powder diffraction instrument currently under construction for use at the Daresbury synchrotron is discussed. This instrument will allow both conventional and energy dispersive studies to be carried out, giving rapid determination of accurate structural parameters. The apparatus will be particularly suitable for the examination of materials in controlled environments such as high temperatures/high pressures etc.

Refinement techniques similar to those currently used in neutron diffraction applied to X-ray powder data sets will be discussed, and it is shown that these techniques, previously applied to energy dispersive measurements (Glazer, Hidaka and Bordas, J. Appl. Cryst. (1978) 11, 165) may also be used successfully with conventional Debye-Scherrer geometry.


The RE⁺⁺⁺ ionic radius is expected to change by possibly 0.1 upon excitation of electronic 4f-5d transitions. Such changes might cause dynamical distortions of the lattice of monoclinic compounds containing RE⁺⁺⁺. The time-dependence in X-ray reflection spectra of Ce₀.₇₂ Tb₀.₃₅ P₂O₁₄ and CeP₂O₇ (monoclinic P2₁/c) has been followed on a time scale of 100 μsec before and after excitation by a 10 ns laser pulse using synchrotron radiation from DORIS at the double-focusing instrument X11. The crystallography of the RE₃⁺⁺⁺ ionic radius is expected to change by possibly 0.1 upon excitation of electronic 4f-5d transitions. Such changes might cause dynamical distortions of the lattice of monoclinic compounds containing RE⁺⁺⁺. The time-dependence in X-ray reflection spectra of Ce₀.₇₂ Tb₀.₃₅ P₂O₁₄ and CeP₂O₇ (monoclinic P2₁/c) has been followed on a time scale of 100 μsec before and after excitation by a 10 ns laser pulse using synchrotron radiation from DORIS at the double-focusing instrument X11. Individual reflections were recorded with a position-sensitive linear gas detector (A. Gabriel). A timing circuitry was synchronizing an excimer laser (XeCl, 30 mJ per pulse focused onto the specimen, λ = 307 nm) running at a repetition rate of 5 Hz. Data were accumu-