14.X-4 ELECTRON DIFFRACTION PHENOMENA FOR VERY LOW ENERGY ELECTRONS. By D.F. Lynch, CSIRO Division of Materials Science and Technology, Normanby Rd., Clayton, Victoria 3168, Australia and A.E. Smith, Department of Physics, Monash University, Clayton, Victoria 3168, Australia.

For most simple crystals of small unit cell size, i.e., axes about 5 A, and for incident electron energies less than 15 eV, there exists only the specularly reflected beam and the incident beam outside the crystal. Thus, for simple arguments, the Ewald sphere only intersects one rod and so the observed intensity is influenced by the structure in the crystal in the direction of the surface normal (the (001) reflections). This simple argument is not supported by experimental result. In practice the effect of the inner potential ensures that the Ewald sphere can intersect other reciprocal lattice rods. The strong dynamic coupling that occurs in low energy electron diffraction ensures that the observed variation of the intensity of the reflected electron beam is strongly dependent on the intersections of the Ewald sphere with these other rods.

The structure observed in the CID experiment of B.H. Nall, A.N.Jette and C.B.Bargeron (1982, Phys. Rev. Letters, 48, 882) is a graphic demonstration of this phenomenon. In the CID experiment the incident electron energy is kept constant and the reflected intensity, as measured by the specimen current, is displayed as a function of angle of incidence.

Calculations using dynamic theory (A.E.Smith and D.F.Lynch, 1985, Surf. Sci.,164, 464-478) show quite good agreement with the reported experiments on Al when the incident energy is very small. Further measurements and calculations have been done for MoS2 (A.E.Smith and D.F.Lynch, 1986, Surf.Sci. to be published). These also show good agreement as can be a seen in Figs 1 and 2.

It is probable that this phenomenon is also of some importance in the interpretation of the contrast observed in the scanning tunnelling microscope, although, in that case, the problem must be considered in terms of a coherent spherical wave source.

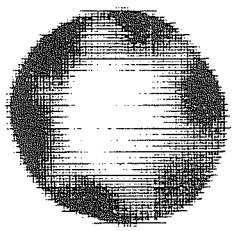

Fig.1 CID pattern from MoS2. Incident energy 5eV.

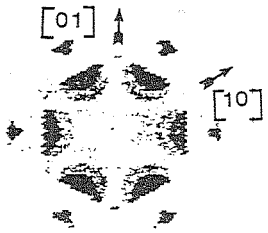

Fig.2 Calculated CID pattern for MoS2. Incident energy 5eV.

14.X-5 RECENT EXAMINATIONS OF THE N-BEAM-DYNAMICAL METHOD IN MATERIALS ANALYSIS. By S. Amelynckx and D. Van Dijk, RUCA (University of Antwerp), 2018-Antwerpen, Belgium.

14.X-6 SURFACE STRUCTURE ANALYSIS OF Si(111)7x7-H BY RHEED. By S. Mizuno, A. Ichimiya, T. Fujii and K. Yamauchi, Department of Applied Physics, Nagoya University, Nagoya 464, Japan.

Rocking curves of RHEED intensities from Si(111)7x7-H surface were analyzed by a many-beam RHEED dynamical calculation(Ichimiya, Jpn. J. Appl. Phys., 1983, 22, 176-180, and ibid, 1985, 24, 1365). Si(111)7x7 surface was exposed to hydrogen atoms, which were dissociated on a hot tungsten filament in pure hydrogen atmosphere. A RHEED pattern from Si(111)7x7-H surface is shown in Fig.1 in the $[11\bar{2}]$ direction of the incidence. The electron energy was 10 keV. The RHEED intensities were measured by a TV-camera with a micro computer system. The RHEED rocking curves on 00-rod(specular reflection) and 11-rod were compared with calculated rocking curves for two models of the surface structure based on the Dimer-Adatom-Stacking-fault(DAS) model(Takayanagi, Tanishiro, Takahashi and Takahashi, Surface Sci., 1985, 164, 367-392) from the intensity distribution of the RHEED pattern in Fig.1: Model(a) shown in Fig.2a is Dimer-Stacking-fault(DS) model with twelve Si-H_3 molecules at random on-top sites and model(b) shown in Fig.2b DS model with hydrogen at on-top sites. Results of the calculations for the both models are shown in Figs.3 and 4 with the experimental results for 00- and 11-rods in the $[11\bar{2}]$ direction. The results for the model(a) are in very good agreements with the experimental rocking curves. For the $[01\bar{1}]$ direction calculated rocking curves for the model(a) were also in good agreements with the experimental ones. It is considered that Si-Si bonds of the adatoms of the DAS structure are broken by hydrogen adsorption and SiH_3 is formed on the random on-top sites of the stacking-fault layer. No agreements between experimental and calculated results were obtained by breaking of the dimer bonds.