are therefore not accessible.

Using the channeling technique, both at high and medium energies, the interfacial reactions at the very first stages of metal depositions on atomically clean Si surfaces in UHV have been studied for a number of metals, namely Au, Pd, Ag, Ni and recently also Ti. These studies have shown, that silicides form, even at room temperature or below, except for Ag, which shows no mixing with clean Si. Using the high depth resolution of Medium Energy Ion Scattering, information has been obtained on the uniformity and morphology of the so formed ultrathin films (0-20 Å), showing that transitions from 2D to 3D film formation are very general phenomena, either directly upon deposition (Ag, Ni) or after annealing (Pd, Ti). The number of Si atoms displaced at the metal-silicon or silicide-silicon interfaces have been determined for most of these systems, ranging from 0-2 monolayers.

Epitaxial silicides and their interfaces with Si form an other interesting group of systems. Ions backscattered in a crystalline material are blocked on their way out by atomic strings or single (surface) atoms, giving rise to so-called blocking minima in the backscattered yield for such directions. With the aid of an analyser with high angular resolution metal- and semiconductor surface structures have been determined, as well as silicide phases, metal or silicide orientations and pseudomorphic growth of epitaxial silicides. Finally, in the case of good epitaxy, as for instance for the lattice matched $NiSi_2$/Si system, the ion beam can be aligned with a silicide channel, such that only the surface and interface layers are hit by the ion beam. These studies have shown, that the interface is highly ordered, showing less than $\sim 3 \times 10^{14}$ Ni atoms/cm^2 to be displaced from lattice positions.

In conclusion, with the development of UHV ion backscattering facilities, and the use of high resolution detectors, it is now possible to study the structure of interfaces and other 2D structures.

14.1–2   DYNAMICAL WAVE FUNCTIONS AND LATTICE IMAGING

by A.F.Moodie and H.J.Whitfield, CSIRO Division of Chemical Physics, P.O.Box 160, Clayton, Victoria, Australia 3168.

Symmetry adapted techniques have been devised for the analysis of dynamical wave functions.

These techniques are applied to various practical problems, including the interpretation of high resolution electron micrographs.

On this basis a new approximation for the direct interpretation of high resolution lattice images is proposed and the results compared both with experiment, and with full multi-slice calculations.

14.1–1   COMPUTER SIMULATION OF CONVERGENT BEAM ELECTRON DIFFRACTION PATTERNS. By N.S. Blom and F.W. Schapink, Laboratory of Metallurgy, Delft University of Technology, Rotterdamseweg 137, 2628 AL Delft, The Netherlands.

Convergent beam electron diffraction (CBED) is a well known technique for determining the space group symmetry of single crystals (Buxton et al., Ph. Tr. R. Soc. London (1976) 281A, 171) and, more recently, of bicrystals (Schapink et al., Acta Cryst. (1983) A39, 805; Buxton et al., Inst. Phys. Conf. Ser. No. 68 (1983) Ch. 2). In both cases the CBED patterns are classified according to 31 diffraction groups, which in turn can be related to the 32 point groups in the single crystal case and to 58 dichromatic point groups in the bicrystal case. In the bicrystal classification, the assumption is being made of having the grain boundary plane coinciding with the midplane of the bicrystal, parallel to its surface plane. This paper is concerned with the effect of the boundary location on CBED pattern symmetry, employing computer simulation based upon the n-beam dynamical theory (Bethe, Ann. Physik (Leipzig) (1928) 87, 55). Results are presented for a silicon bicrystal with a <111> twin boundary showing a 6 mm bright field (BF) symmetry and a 3 m overall symmetry (WP). Further it is confirmed that a particular translation along the boundary results in a decrease in symmetry of both BF and WP, in agreement with previous expectations (Schapink et al., Acta Cryst. (1983) A39, 805).

14.1–3   CBED PATTERN SYMMETRY ASSOCIATED WITH THE SYMMETRY INCLUDING THE TRANSLATION COMPONENT NORMAL TO THE SURFACE. By K. Ishizuka, Institute for Chemical Research, Kyoto University, Uji 611, Japan

The symmetry of convergent-beam electron diffraction (CBED) patterns was investigated by Goodman (Acta Cryst. (1975) A31, 804) and Buxton, Eades, Steeds and Rackham (Phil. Trans. Roy. Soc. London (1976) A281, 171). The extinction bands in CBED associated with the translation parallel to the surface was studied by Gjønnes and Moodie (Acta Cryst. (1965) A19, 65). However, there was a distinct discrepancy concerning the CBED symmetry associated with the symmetry operation which has a translation component normal to the surface: Goodman predicted no associated symmetries, while Buxton et al. assumed no detectable effects of the translation. Moreover, the extinction band associated with the translation normal to the surface was also observed (e.g. Steeds, Rackham and Shannon, Inst. Phys. Conf. Ser. 41 (1978) 135).

The present author showed that an approximate symmetry and extinction bands are expected for the symmetry operation including the translation component normal to the surface, and the detection of the deviation meight be difficult (40th Ann. Proc. EMSA (1982) 684). In this report, the dynamical calculations based on the multislice method has been carried out to verify the previous arguments. The calculations show that the extinction associated with the d-glide planes in the natural spinel ($MgAl_2O_4$) is almost complete: the intensity at the extinction band is always less than 1×10^{-5} of an unit intensity, while the intensity of bright lines appeared in a 200 disk is increased with the specimen thickness and becomes more than 1×10^{-3} even at the thickness of 450 Å. The deviation from a mirror symmetry expected for the d-glide planes is negligibly small.