14.4-18   SYSTEMATIC HRTEM IMAGING OF TETRAHEDRAL
SEMICONDUCTORS.   By R.W. Glaisher[1,2], David J.
Smith[2] and A.E.C. Spargo[1], School of Physics,
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The characterisation of the structure of
tetrahedral semiconductor crystals, and
particularly the identification and refinement of
defect structures, in high resolution TEM studies
is hindered by the complexity of the images, even
for perfect crystals, and the sensitivity of them
to several critical experimental parameters.
Techniques have now been devised to determine these
parameters to adequate precision either by the
deliberate use of low resolution images combined
with a suitable choice of accelerating voltage or
by imaging at the highest currently attainable
resolution where the non-linear scattering and
interference effects that contribute to the fine
detail in the image (in the perfect crystal
regions) can be exploited. Experimental studies on
Si and Ge at 100 kV and 400 kV have confirmed this
approach. For the binary compound semiconductors,
having either the sphalerite or wurtzite structure,
an important step for atomic level image
interpretation is the identification of the
absolute direction of the polar axis. That this
can be done by direct observations on
characteristics in the images (both high and low
resolution) of perfect crystal regions has been
investigated experimentally using InAs and CdSe
crystals.

14.4-19   DYNAMICAL DIFFRACTION EFFECT ON HIGH
RESOLUTION ELECTRON MICROSCOPY OF ALLOYS WITH IMPERFECT
ORDER. BY D. Shindo, K. Hiraga and M. Hirabayashi, The
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In this paper, we discuss the characteristic dynamical
diffraction effect on the atomic scale images of
ordered alloys observed by many-beam electron
microscopy. In an imperfectly ordered alloy, the
dynamical effect on the scattering amplitude of a
superlattice reflection $\Psi_t(H+h)$ at the crystal
thickness t can be presented with "dynamical factor"
$D_t(H+h)$ in the relation
$$\Psi_t(H+h) = G(h) \, F(H+h) \, D_t(H+h),$$
where $G(h)$ is the geometrically defined structure
factor and $F(H+h)$ is the difference of the scattering
factors of constituent atoms for the superlattice
reflection $H+h$. Thus $G(h) \cdot F(H+h)$ corresponds to the
kinematical scattering amplitude of the superlattice
reflection. This relation holds under the conditions
$$|\Psi(H)| > |\Psi(h)|, \text{ and } G(h) = G(H+h),$$
where $\Psi(H)$ is the scattering amplitude of the
fundamental reflection H. The dynamical factor $D_t(H+h)$
does not directly depend on $G(h)$, and so that it can
be evaluated without postulating any ordered atomic
arrangement as far as the alloy composition is known.
With calculation of D_t as functions of $H+h$ and t for
some alloy systems, it was shown that the dynamical
factor tends to take a constant value for h ($H=0$) even
in a rather thick crystal of the alloy of which $F(H+h)$
is small. Thus if the optimum conditions of defocus
and aberrations are satisfied, the high resolution
images of such alloys with imperfect order may be
interpreted kinematically in terms of the projection of
the imperfectly ordered atomic arrangements as in the
case of perfectly ordered alloys (D. Shindo, Acta
Cryst., 1982, A38, 310-317).