of relatively large blocks in a form of oriented "co-

lumn" grown on the seed crystal, which were strongly
twinned by the plane (1 1 0) of the 2 1 0 growth axis. The crystals grown
in Space consisted of blocks, too, but the "columns"
have smaller diameters and were much less twisted.
Natural crystal walls, parallel to the (1 1 1) plane,
had been found in some parts of the crystal. The density of dislocations was similar in all crystal
blocks (10^13 cm^-2). A thin layer of vapour-grown crys-
tal covered partially the side walls of the seed crys-
tal. A constant ratio of the characteristic line in-
tensities for the three elements along the crystal
has been found. Analyses for the cross-section parallel
to the growth axis have shown no significant dif-
cferences in composition homogeneity between the crys-
tal grown in Space and that on the Earth. The sample refers
to the cross-section in the plane perpendicular
to crystal longitudinal axis, except for Pb and Sn where the distribution of those elements showed some-
what smaller fluctuation. Some areas containing PbSe
precipitates (density ca 1 x 10^10 cm^-2) in the seed
and also partially in the Earth-grown one were observed. The crystal grown in Space exhibited
PbSe precipitates (density 1.5 x 10^10 cm^-2) in the
bulk, and Inclusions of PbTe, PbSe, Te, Te, situated
on the plane parallel to the boundary between the
grown crystal and the seed part.

07.1.02 TWINNING OF EPITAXIAL DIAMOND FILMS GROWN
FROM GASEOUS PHASE. By M.D. Klyava, A.E. Alexenko,
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Epitaxial diamond films were grown from the gaseous phase
of carbon containing compounds at temperatures of about
1000°C and pressures less than 1 atm. The films were
grown on the natural faces (1 1 1) of diamond as well as on
the (1 1 0) and (1 0 0) surfaces of polished diamond
substrates. Film morphology was studied at room tempera-
ture. Samples were taken out of the chamber after each stage of growth, which made it possible to observe the
surfaces of the samples at different thicknesses. These
repeated interruptions could lead to surface changes due
due to cooling and to additional defects arising from the
interruptions. Growth layers and specific square
figures of growth were always seen on the (1 1 0) substrates.
Tangential growth of the layers and the formation of new ones can be seen from stage to stage. The generation
of new layers always occurred at the same points. When
the film is thinner than 1-2μm, the top of each square pyramid has a point which generates new layers. These
defects grow with film thickness. When they reach some
microns it becomes possible to conclude that each de-
fect is a protrusion over the surface of a square pyra-
id. The protrusion is formed by triangular facets
which form asymmetric pyramids turned towards one of
the four [1 1 0] edges. All four orientations of the pro-
trusion are equally probable. This fact allows one to
suggest that the visible defects are diamond twins. The
distribution of goniometer signals from the grown films
corresponds to the locations of diamond facet projections
according to the four possible twin orientations ac-
cording to the spinel law. The causes of this twinning
under the spinel law are unknown. Extreme changes in
the conditions before and after interruption of the
growth are of great importance. Some particles can be
deposited on the as-grown film surface and can stimu-
late the generation of the twins. The number of twins
increases with the number of cycles of growth and
with film thickness. Thus, a single-crystal film 70μm
thick turns into polycrystalline. The loss of thermo-
stability is clearly displayed at the locations of the twin clusters; they become dark brown or black after
annealing. Film sections with isolated twins do not
undergo any noticeable changes during two-hour anneal-
ing at a temperature of 1400°C. The structural changes
which lead to the loss of transparency of the film begin
in the sections with high twin density in the film,
or at the film-substrate boundary, but not on the sur-
face. The density of dark spots and their areas in-
crease with the duration of the annealing. Different
intensity of darkness can be seen in almost every dark
spot, its bounds being clear. It may be concluded
that the film structure changes layer by layer. It can
be supposed that the process begins in the twin boundary
and then spreads along the surface and into new layers.

07.1.03 ADVANCES IN THE APPLICATIONS OF THE
HOLOGRAPHIC INTERFEROMETRY TO THE STUDY OF
CRYSTAL GROWTH FROM SOLUTION. By F.Bedarida
and L.Zeglio (Istituto di Mineralogia), P.
Ottonello and C.Pontiggia(Istituto di Fisica),
Università di Genova, Italy.

Changes of concentration near a crystal
from a supersaturated solution have
been investigated in the past by
classic optical interferometry. Holographic
interferometry gives the possibility of
working in larger volumes (some tens of cm^3),
where the convective movements affecting the
growth process may be easily checked. In all
these techniques, only a mean refractive index
of the solution may be measured via the
interference fringes produced by the overall
optical path-length variations. A real three
dimensional map of the refractive index
variations is obtained from multi-
directional holographic interferometry.
Since the refractive index is generally a
function not only of concentration but of
temperature, too, the temperature variations
near the interface of a growing crystal have
been tested by thermocouple probes; values of
the order of 10^{-2} °C have been measured
during the growth of a NaClO3 crystal from a
1% supersaturated solution. Therefore, the
interference fringes obtained experimentally
may be related directly to the distribution
of concentration near the growing crystal.