



INTERNATIONAL ATOMIC ENERGY AGENCY
UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION



INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS
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CABLE: CENTRATOM - TELEX 460392-1

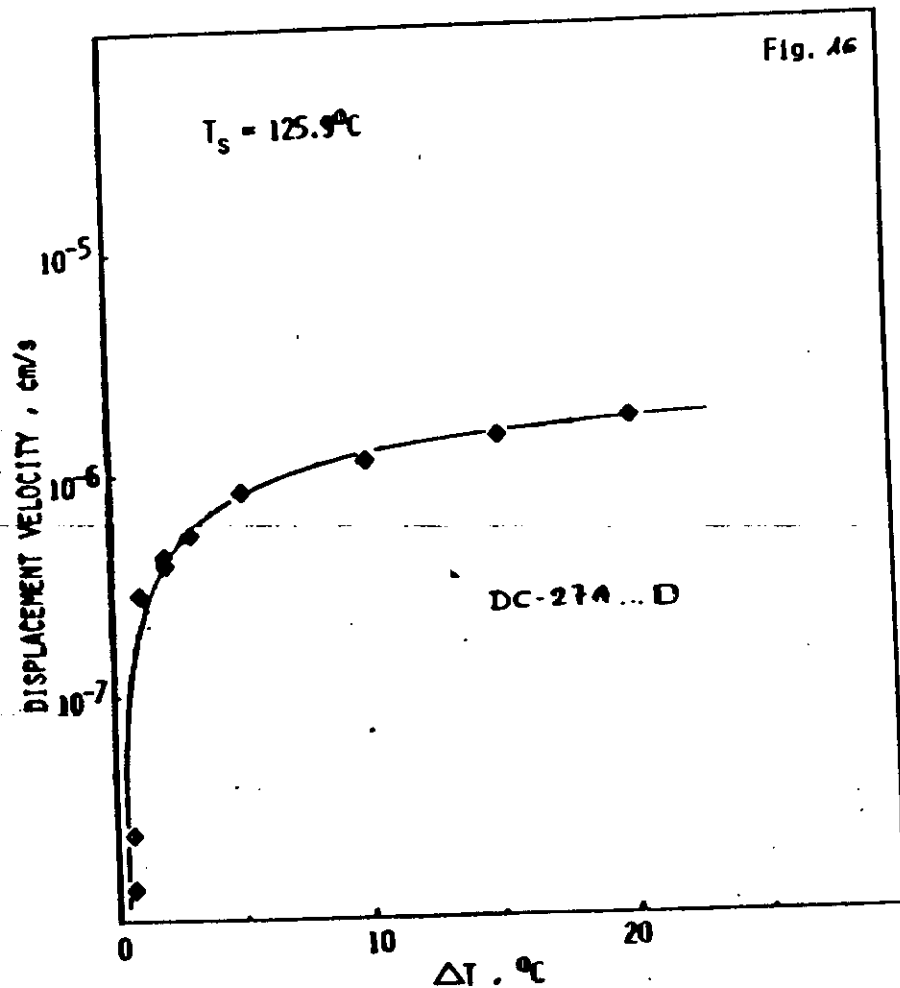
SMR/382- 16

WORKSHOP ON SPACE PHYSICS:
"Materials in Microgravity"
27 February - 17 March 1989

"Mass Transport Rates"

E. KALDIS
ETH
Zurich, Switzerland

Please note: These are preliminary notes intended for internal distribution only.



HIGH PRECISION LENGTH MEASUREMENTS IN CRYSTAL GROWTH

E. Kaldis
ETH-Zürich

1 "OPTICAL TOMOGRAPHY"

- Rotation of video camera or of object (stepwise). Calculation of the edge position.
- Suitable for slow growing crystals
- High mechanical precision (gas bearings) necessary, otherwise not applicable
- length Resolution (estimated) $\approx 10 \mu (4 \mu)$
- Estimated costs (rough personal estimate)

$\sim 30 - 40\,000 \$$

2. CCD-Optical Arrays

Diameter control or crystal edge position (growth rate) monitoring

RESOLUTION 0,05% of range

Length Range 1 - 1000 mm depending on lenses used

Actual Resolution

for 1 mm range → 0,0005 mm ①

for 10 mm range → 0,005 mm ②

Working distance ① 15 mm

② 39 mm

Estimated price 20-25000 \$

