

## PREFACE

Oji International Seminar on Morphology and Growth Unit of Crystals was held at Astraea Hotel, Zao Hot Spring, near the summit of an active volcano Zao, Yamagata Prefecture, on August 25–31, 1985. The Seminar was organized under the auspices of The Japan Society for the Promotion of Science and The Fujihara Foundation of Science.

The Seminar was aimed at providing a forum where intensive discussions on the subject and friendly personal contacts among scientists interested in the same subject but from different research fields could be made. To realize this aim, the numbers of participants were limited to about 60, including supporting postgraduate students. 17 foreign participants from 7 countries (1 from Germany, 1 from Israel, 1 from Italy, 3 from P.R. China, 2 from The Netherlands, 1 from Spain, 4 from USA and 4 from USSR) joined 45 Japanese participants; all stayed and dined in the same hotel throughout the period. The entire hotel of 240 capacity was reserved for the seminar throughout the period, which made the atmosphere of the meeting very friendly. The participants were from different research fields; theoretical and experimental physics, inorganic and organic chemistry, biological science, crystallography, mineralogy, snow and ice, semi-conductor technology, crystal growth and synthesis.

The Seminar consisted of oral presentations by the invited speakers, and poster presentations by contributions, which are listed in the followings

### Oral Presentation

Morphology and growth unit of crystals, An Introduction

I. Sunagawa

Surface structure of a Lennard Jones crystal, a review

J. Van der Eerden

Crystal shapes viewed as mechanical equilibrium of steps

M. Uwaha and P. Nozieres

Monte Carlo studies of equilibrium crystal shapes

Y. Saito

Thermal evolution of crystal shapes on  $\alpha$ -Ag<sub>2</sub>S

T. Ohachi and I. Taniguchi

Crystallography of metal smoke particles

R. Uyeda

Dynamic behavior of small metal particles

S. Iijima

On the structure of a quasicrystal — Three dimensional Penrose transformation—

T. Ogawa

Icosahedral quasicrystals of rapidly-solidified Al-Mn alloys observed by high resolution electron microscopy

K. Hiraga, M. Hirabayashi, A. Inoue and T. Masumoto

An experimental investigation of stability of planar interface and development of cellular interface during Czochralski growth of LiNbO<sub>3</sub> single crystal doped with Yttrium

Nai-ben Ming and Fang-giao Zhou

Interface shape and flow transitions in Czochralski grown GSGG single crystals

Y. Miyazawa

Surface roughening related to the polymorphic transition in CBr<sub>4</sub>

Nai-ben Ming

Surface melting

A. A. Chernov and V. Yakovlev

Morphological stability during alloy solidification

S. Coriell and G. B. McFadden

Dendrite growth of crystals (Theory)

H. Muller-Krumbhaar

A heuristic model of snowflake morphology and growth

C. Schneer

Ventilation and growth form of crystals

J. Hallett

The quantitative growth law of ice crystal and its new model  
Ang-Sheng Wang

Morphology of ice crystals grown from vapour and melt phase  
T. Kuroda

Initial stages of morphological instability of vapour grown ice crystals  
D. Nenow, V. Stoyanova and N. Genadiev

Molecular dynamics and Monte Carlo simulation of equilibrium and crystal growth  
T. Cherepanova

In-situ observation of crystal surface and its surrounding  
K. Tsukamoto

High-resolution NMR spectroscopy of local structure of glasses  
J. Kirkpatrick

A phenomenological approach to find a growth unit in crystal growth from aqueous solutions  
T. Ogawa

Morphology and kinetics of growth from aqueous solution  
A. A. Chernov

Growth and dissolution steps on natural and synthetic micas  
A. Baronnet

Step bunching due to impurity adsorption: a new theory  
J. Van der Eerden and H. Muller-Krumbhaar

A numerical analysis for the supersaturation distribution around LPE macrostep  
T. Nishinaga, C. Sasaoka and A. A. Chernov

Growth units and solvent-dependent crystallization of polymorphic modifications of lipids  
K. Sato and M. Okada

Mechanism of crystal growth from boiling water solutions of soluble inorganic salts, mainly KDP  
R. Rodriguez Clemente, Veintemilles-Verdagur, and F. Rull-Perez

Morphology of hydrothermally grown fayalite crystal  
S. Hirano, Y. Iwai and S. Somiya

Coincidence site conjugation of cholesterol monohydrate crystals  
H. Komatsu

Crystalgraphs, connected nets and the morphology of crystals  
P. Bennema

Equilibrium and growth kinetics of polar crystals  
D. Aquilano

Toward Ab-initio derivation of crystal morphology  
Z. Berkovitch-Yellin, L. Addadi, M. Lahav and L. Leiserowitz

#### Poster Presentation

Morphology of fine metal crystallites of Mg, Zn and Mn made by gas-  
evaporation method  
T. Okazaki

On the growth of a cubic octahedral crystal with polarity  
Y. Saito and C. Kaito

Morphology, internal defect and grain boundary of ultra fine GaP particles  
C. Kaito, Y. Saito and K. Fujita

Growth units in a simplified system of solution growth  
M. Kitamura, S. Hosoya and T. Miyata

The growth characteristics of the III-V compound like crystals affected by the  
relative activity  
A. Ookawa, N. Akutsu and Y. Asakura

Experimental and theoretical morphology of salol crystals  
Jin Wei-qing, H. Komatsu and T. Inoue

Relation between morphology and interfacial roughness in melt growth of  
ionic crystals  
T. Sawada and T. Shichiri

Structural perfection of melt grown alkali helide crystals

V. Erofeev

X-ray topography and surface microtopography of colour-zoned tourmalines  
from Xinjiang, China

Liu Guobin

Growth-induced anisotropy and its growth kinetic dependence

K. Kitamura, S. Kimura, J. M. Desvignes and H. Legall

Growth of ice crystals from vapour phase -dependence of kinetic coefficient  
on supersaturation and on air pressure

T. Kuroda and T. Ganda

Habit of ice crystals grown in air at a low pressure

T. Gonda and T. Sei

Morphology of ice crystals grown in a slowly flowing supercooled cloud

T. Ohno and A. Yamashita

Surface roughening and quasi-liquid surface layer

D. Nenov and A. Trayanov

Ellipsometric study of the quasi-liquid layer at the surface of ice crystals

Y. Furukawa, M. Yamamoto and T. Kuroda

The disc-polyhedral transition and the influence of strain on ice crystals  
growing epitaxially on CuS

J. Hallet

In-situ observation of growth and dissolution processes at elevated tempera-  
ture

M. Kawasaki, T. Abe, H. Nakamura, K. Tshukamoto and I. Sunagawa

Morphological changes of forsterite and diopside depending on supercooling  
and compositions

T. Abe, K. Tsukamoto and I. Sunagawa

Nucleation from silicate melts in the turbulent flow

K. Iishi

Effect of convection on morphology of minerals grown in basaltic magma

A. Kouchi, A. Tsuchiyama and I. Sunagawa

Nucleation kinetics of plagioclase crystals in artificial basaltic melt  
K. Watanabe and M. Kitamura

Metastable nucleation in silicate systems  
H. Nakamura, T. Abe, K. Tsukamoto and I. Sunagawa

Method to reproduce three-dimensional behavior of LPE macrostep  
T. Nishinaga, C. Sasaoka and M. Washiyama

Surfacemicrotopography of SiC crystals  
Mineralogy Group

Step morphology and lamellar stacking sequences in polymorphs/polytypes  
of long-chain compounds  
M. Okada and K. Sato

Effect of Impurities upon step advancement and step roughening  
Lu Tai Jing, S. Ogihara, K. Onuma, K. Tsukamoto and I. Sunagawa

Dissolution forms of KCl crystal in aqueous solution  
T. Nishida

Mass flow around a growing and dissolving crystal in aqueous and high  
temperature solutions  
K. Onuma, T. Abe, H. Nakamura, K. Tsukamoto and I. Sunagawa

Morphology and perfection versus supersaturation in aqueous solution  
growth, A case study on Ba (NO<sub>3</sub>)<sub>2</sub> crystals  
K. Maiwa, K. Onuma, K. Tsukamoto and I. Sunagawa

Macro and micro-morphology of the single crystals of intermetallic phases of  
Nb-Sn system  
T. Inoue, M. Shimizu and H. Komatsu

Effect of H<sub>2</sub>O upon the morphology of diamonds grown from nickel at high  
temperature and pressure  
H. Kanda, T. Ohsawa, O. Fukunaga and I. Sunagawa

An extended PBC method  
T. Miyata, M. Kitamura and I. Sunagawa

Role of a spiral with negative curvature in growth of an euhedral crystal  
M. Kitamura and I. Sunagawa

All papers were presented as well in the form of poster throughout a day and night. Evening discussions were stimulated by a help of sake and other drinks, and often continues to midnight.

The sessions were held on the following topics:

He crystals; Equilibrium Form; Ultra-fine Particles; Quasi-crystals; Melt Interface; Morphological Stability; Snow Crystals; Multi-component Systems and Diffusion Boundary Layers; Growth Unit; Step Patterns; Real Systems; Structure and Morphology.

It appears that the Seminar marked an important step in the history of the basic science of crystal growth, since experimental evidence proving the existence of quasi-liquid layer or liquid-crystal like boundary layer around a growing crystal were reported concurrently on different materials, by different methods and from different research groups. These results request the theoreticians to reconsider the crystal growth models which have been based on much simpler, naked solid-liquid interface and atomic or ionic growth unit models. As a convener, I was very much satisfied with the Seminar.

This book consists of refered papers, selected from the contributions at the Seminar, The editor acknowledges the patience of the authors to wait for the rather delayed publication, which is entirely due to the fault of the editor. He also expresses his sincere thanks for the financial and moral supports to The Fujihara Foundation of Science and The Japan Society for the Promotion of Science.

Editor  
I. Sunagawa