# Crystal growth



- Complex transport phenomena (mass, heat, momentum)
- Interfacial phenomena between different phases:
  - o Marangoni convection
  - o Stress relaxation





- Control method of transport phenomena :
  - Rotation
  - o Magnetic field
  - o Electronic field

# Alloy semiconductor

### Alloy semiconductor (InGaSb, SiGe, CdZnTe, etc.)

#### Advantage



- Variable composition ratio. Controllable wavelength and lattice constant







 $\rightarrow$  New photo-voltaic device

Problem



- Separated solidus/liquidus lines
- Density difference
- Different melting point

**Difficult to grow** a high quality crystal because of segregation and convection

# Microgravity experiment at ISS



### Generalization of crystal growth method for alloy semiconductor

→ Understanding of growth kinetics

> High cost Few chances

1G preliminary experiment



- Convection
- Gravity segregation

 $\mu$ G experiment



- Diffusion
- Calm on interface

N. Armour et al, J. Crystal Growth, 299, pp. 227-233 (2007).



## Problems

Dissolution process of In<sub>x</sub>Ga<sub>1-x</sub>Sb



Hayakawa et al., Private Communication (December 2012)

### InGaSb Alloy



### SiGe

#### **Dissolution**

#### Heating rate : 5 °C/min



#### Composition of Si at the center

