

Gravity effect on liquid phase epitaxy of semiconductor crystals

March, 1996

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The yo-yo solute feeding method is a new LPE technique using the difference in density between solute and solvent. In this technique, natural convection is employed as a driving mechanism for solute transport in the liquid phase.

A parametric study was conducted to determine the optimum spacing between substrates for effective convection. When the spacing was reduced below a critical value the growth rate dropped abruptly.

Further investigation was undertaken to understand the growth process from a tin solution. The effect of cooling rate and of spacing between upper and lower substrates was examined.

A numerical description of the growth process is given. Calculated results shows that the observed phenomena can be explained on the basis of the solutal convection model with consideration of the surface reaction.

The effect of gravity on both dissolution and growth of GaAs in Ga-As system has been investigated. It was found that dissolution of GaAs occurred mainly on the lower substrate while growth on the upper substrate was much larger than that on the lower substrate. Based on these facts, the layer with the thickness of about 80 μm was successively grown by the yo-yo solute feeding method with 8 yo-yo repetition times between 700 and 650 $^{\circ}\text{C}$. These results imply that density of Ga-As solution decrease with increasing of solute concentration.

The effect of gravity on both dissolution and growth of GaSb in Ga-Sb system has been investigated and structure of solution was discussed. Tendency in growth and dissolution between upper and lower substrates was similar to Ga-As system. It is concluded by the studies that a solute will be treated as a very tiny particles with the crystal-like structure. However, the structure of solution is still studying.