

PHYSICS COLLOQUIUM

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“Growth of Single Semiconductor Crystals”

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Single crystals are needed for electronic and optoelectronic devices. Materials having grain boundaries and other defects can not be used, because the grain boundaries disrupt the flow of electrons and photons. Therefore, single crystals are essential for a broad set of technologies, such as electric power production, defense, information and communications.

Crystals can be grown using a remarkable variety of techniques, including the melt growth, solution growth and growth from the vapor phase. The most important techniques for melt growth (Czochralski pulling, directional solidification, etc.) and purification (zone melting) will be described.

The crystalline and chemical perfection of most crystals depends on the heat and mass transfer occurring during their processing. Therefore, the results obtained by growing the semiconductor crystals under diffusion controlled conditions (in microgravity, at the International Space Station), and on earth will be presented. Furthermore, the procedures used to purify, synthesize and grow the wide band gap semiconductor crystals needed for room temperature detection of nuclear radiation, will be described.