

50th AIAA AEROSPACE SCIENCES MEETING ABSTRACT

Reduction of Defects in Germanium-Silicon

M. P. Volz

NASA, Marshall Space Flight Center, EM31, Huntsville, AL 35812, USA

K. Mazuruk

University of Alabama in Huntsville, Huntsville, AL 35762, USA

A. Cröll

Kristallographisches Institut, University of Freiburg, Freiburg, Germany

Crystals grown without being in contact with a container have superior quality to otherwise similar crystals grown in direct contact with a container, especially with respect to impurity incorporation, formation of dislocations, and residual stress in crystals. “Detached” or “dewetted” Bridgman growth is similar to regular Bridgman growth in that most of the melt is in contact with the crucible wall, but the crystal is separated from the wall by a small gap, typically of the order of 10-100 microns. $\text{Ge}_{1-x}\text{Si}_x$ crystals have been repeatedly grown detached in pBN crucibles. Detached-grown crystals exhibited superior structural quality as evidenced by measurements of etch pit density, synchrotron white beam X-ray topography and double axis X-ray diffraction. Experiments have also been conducted to assess the effect of pressure differential across the meniscus in sealed crucibles. The experiments were in agreement with calculations which predicted that stable detachment will only occur in crucibles with a high wetting angle and over a relatively narrow range of pressure differential. Calculations also indicate that the conditions for stable detached growth are greatly expanded in a microgravity environment.