

The NASA microgravity materials program is dedicated to conducting microgravity experiments and related modeling efforts that will help us understand the processes associated with the formation of materials. This knowledge will help improve ground based industrial production of such materials. The currently funded investigations include research on the distribution of dopants and formation of defects in semiconductors, transitions between columnar and dendritic grain morphology, coarsening of phase boundaries, competition between thermally and kinetically favored phases, and the formation of glassy vs. crystalline material.

NASA microgravity materials science investigators are selected for funding either through a proposal in response to a NASA Research Announcement or by participation in a team proposing to a foreign agency research announcement. In the latter case, a US investigator participating in a successful proposal to a foreign agency can then apply to NASA for funding of an unsolicited proposal.

The program relies on cooperation with other aerospace partners from around the world. The ISS facilities used for these investigations are provided primarily by partnering with foreign agencies and in most cases the US investigators are working as a part of a larger team studying a specific area of materials science.

The following facilities are to be utilized for the initial investigations. The ESA provided Low Gradient Facility and the Solidification and Quench Inserts to the Materials Research Rack/Materials Science Laboratory are to be used primarily for creating bulk samples that are directionally solidified or quenched from a high temperature melt. The CNES provided DECLIC facility is used to observe morphological development in transparent materials. The ESA provided Electro-Magnetic Levitator (EML) is designed to levitate, melt and then cool samples in order to study nucleation behavior. The facility provides conditions in which nucleation of the solid is not triggered from the wall and in which fluid flows in the sample can be controlled and manipulated. These conditions allow scientists ideal conditions for understanding the relative amounts and distribution of different phases that form in the solid. Finally, the Coarsening of Solid Liquid Melts hardware allows quenching of low temperature samples in the Microgravity Science Glovebox.