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Floating the Ball: Advances in the technology of electrostatic levitation

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Electrostatic Levitation (ESL) is an emerging technology. The MSFC ESL is a NASA facility that supports investigations of refractory solids and melts. The facility can be used to process a wide variety of materials including metals, alloys, ceramics, glasses and semiconductors. Containerless processing via ESL provides a high-purity environment for the study of high temperature materials and access to metastable states. Scientific topics investigated in the facility include nucleation, undercooling, metastable state formation and metallic glass formation. Additionally, the MSFC ESL provides data for the determination of phase diagrams, time-temperature-transition diagrams, viscosity, surface tension, density, heat capacity and creep resistance. In order to support a diverse research community, the MSFC ESL facility has developed a number of technical capabilities, including a portable system for in situ studies of structural transformations during processing at the high-energy X-ray beamline at the Advanced Photon Source of Argonne National Laboratory. The capabilities of the MSFC ESL facilities will be discussed and selected results of materials processing and characterization studies will be presented.