

Submersion Quenching of Undercooled Liquid Metals in an Electrostatic Levitator

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The NASA Marshall Space Flight Center (MSFC) electrostatic levitation (ESL) laboratory has a long history of providing materials research and thermophysical property data. The laboratory has recently added a new capability, a rapid quench system. This system allows samples to be dropped into a quench vessel that can be filled with a low melting point material, such as a gallium or indium alloy. Thereby allowing rapid quenching of undercooled liquid metals and alloys. This is the first submersion quench system inside an electrostatic levitator.

The system has been tested successfully with samples of zirconium, iron-cobalt alloys, titanium-zirconium-nickel alloys, and silicon-cobalt alloys. This rapid quench system will allow materials science studies of undercooled materials and new materials development, including studies of metastable phases and transient microstructures. In this presentation, the system is described and some initial results are presented.