

Inductive Measurement of Electrical Resistivity and Density of Fe₉₀Ni₁₀, Fe₇₂Cr₁₃Ni₁₅ and Fe₇₂Cr₁₇Ni₁₁ Using the Sample Coupling Electronics on Board the ISS Space Station

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The Sample Coupling Electronics (SCE) hardware in the ESA Electromagnetic Levitator on board the International Space Station (ISS-EML) was used to investigate the measurement of electrical resistivity and density of select ferrous alloys. The measurement method involves positioning electrically conductive spherical samples inside the electromagnetic field generated by water-cooled copper coils. Levitated metallic samples can thus be heated to melting and cooled back to the solid phase through appropriate selection of processing conditions using containerless processing techniques. Through the analysis of current-voltage phase shifts and changes in the coil's impedance, we can determine the complex impedance of the samples and calculate the electrical resistivity and density as functions of time and temperature.