Oscillation of a Multiphase Core-Shell Compound Droplet in Reduced Gravity

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The oscillating droplet method has been utilized to measure surface tension of molten metals. A levitated molten metal droplet is excited by an electromagnetic impulse for electromagnetic levitation or by a superimposed electrostatic field for electrostatic levitation. Once the desired amount of deformation is achieved, the sample is let dampen freely. By extracting the oscillation frequency during free oscillation, the surface tension is measured using the Rayleigh equation. This method has now been extended to measure the interfacial tension of undercooled copper-cobalt and steel-slag systems in the International Space Station. Recent efforts to support the space experiments will be presented. A numerical model was developed to predict the oscillatory behavior of a multiphase core-shell compound droplet in a reduced gravity environment. The predicted results were validated by those obtained by a sounding rocket experiment. The validated model will be utilized to support the design of the space experiments and the interpretation of the results downloaded from the International Space Station.