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MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Microgravity Sciences Onboard the International Space Station and Beyond - Part 1 (6)

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CRITICAL PHENOMENA STUDIES UTILIZING DECLIC

Abstract

The DECLIC (Dispositif pour l'Etude de la Croissance et des LIquides Critiques) facility on board International Space Station (ISS) is an ideal platform to study the critical phenomena without gravity effects. Latest turbidity measurements utilizing the DECLIC facility showed that the turbidity of SF6 fluid at an off-critical density (#1% off from the critical density) could be measured precisely at reduced temperatures to within t # 10-7. In the future, we plan to perform measurements using a re-filled fluid sample cell at the critical density within 0.1% of its critical value. The result will determine the Green-Fisher critical exponent on liquid-gas critical point system with a precision not attainable on ground-based experiments. After a short presentation of the results obtained from the turbidity measurements at off critical density, we describe a high symmetrical design of similar optical cells which allows expecting a precision of 5.10-4 on the value of the average density of a fluid, relatively to its critical density. This is accomplished by measuring the position of the liquid-gas meniscus and the density gradient as a function of the temperature difference from the critical temperature. Combining different fillings of the cells and relative effects of the dead volumes in presence of the Earth' gravitational acceleration, we use the compressibility effects to discuss the ground experimental determinations of three main properties of the critical fluid SF6: i) the rectilinear diameter law, ii) the amplitude of the shape of the critical isotherm, and finally iii) the absolute critical density. The expected results for the future turbidity experiments using this highly symmetrical sample cell filled with SF6 at critical density in weightlessness condition are discussed as a conclusion.