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UNVEILING THE MYSTERIES OF CRITICAL FLUIDS IN MICROGRAVITY: BRIDGING MATERIALS SCIENCE AND ASTROCHEMISTRY

Abstract

Exploring critical fluids in microgravity constitutes a new frontier in the realm of materials science and astrochemistry. It provides unique insights into understanding the complex behavior of these fluids and their potential applications. This research further elucidates the delicate fluid dynamics of critical fluids free from the pervasive gravity of Earth. This includes understanding: their phase separation processes, their thermo-dynamic properties, and how molecules interact with one another in proximity t a critical point. Educating the reader on what used to be understood vital fluid processes only through the lens of terrestrial work but are Now — critical for understanding fluid dynamics in space — so that ne day, new materials can be designed and the reliability and performance improved of existing materials in future spacecraft and extraterrestrial outposts. This study employs the unique environment of microgravity together with state-of-the-art experimental setups on space stations and computations based on complex computational models. Discoveries include major deviation in phase separation processes, surface tension, and viscosity of these fluids, indicating properties never before seen on Earth. These findings are crucial to creating new materials with wholly enhanced properties, creating complex molecules like those of interest to astrochemistry vital to the understanding of the chemical reactions occurring in the interstellar cluds of our universe and the ultimate composition of our universe. This research not only extends ur understanding of critical fluids in microgravity but it also bridges between materials and astrochemistry. Interdisciplinary in nature, this research underscores the tremendous value in conducting experiments in space in explicating mysteries of the universe, and in advancing additinal new frontiers in material science and the study of chemistry.