DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

(State the objective of the project, describe the research to be carried out, and present reasons for choosing the research topic - max. 1 standard type-written page)

The sedimentation process, i.e. gravity induced diffusion, is wildly known as the transport phenomena of macroscopic solutes induced by gravitational or centrifugal field. The sedimentation of isotope atoms in liquids is important from the point of view of separation of isotopes. Enriched isotopes are crucial in the fields of atomic energy ^{235}U, ^{6}Li, etc. medical treatment ^{50}Cr, ^{168}Yb, etc., and in the information technology field for quantum computing ^{29}Si, etc. The materials science studies using microgravity has been performed to fabricate high quality materials or single crystal protein, etc. by preserving convection and mixing uniformly. On the other hand, a strong gravity enables to control compositions or structure, crystalline state, etc., because small difference in atomic weight influences the concentrations, lattice ordering or crystalline state under such strong gravitational field. By the sedimentation, we can aim at a materials control in atomic scale, and realize discovery of new materials or new properties. It is expected that the strong gravitational field will be used as a new method of atomic-scale materials processing to control the composition, impurities, nanostructure, and interface structure of materials, and to concentrate isotopes.

In this project we attempt to simulate the sedimentation process in multicomponent and multiphase systems. The project is expected to provide a valuable predictive tool for the material science specialist as well as for general audience engaged in the diffusion studies. The new methods developed will be used in synthesis and modeling of the behavior of the gradient materials. Moreover, the ability to predict and understand the influence of the gravitational field will have many applications in the broad field of materials processing and will be the foundation of the future progress of the theory and material design. The project will allow to recent progress and future prospects for materials processing.