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Micro-convection induced by the mass flux at the interface of a dissolving particle. OLGA LAVRENTEVA, TECHNION, Chemical Engineering Dept., MARIA DOICHINOVA, CHRISTO BOYADJIEV, Institute of Chemical Engineering, Bulgarian Academy of Science — The classical general equations modeling mass transfer between a solid particle and ambient fluid medium are normally simplified and the means of simplification are different for gaseous and liquid medium. The major part of the works considering diffusion in liquids are based on the assumption of an infinitely diluted solution, which implies that no mechanical properties of the solution, including its density, depends on concentration, while the concentration flux satisfies the first Fick's law. Under this assumption, the velocity field is independent from the concentration, which is determined for a given velocity field from the convection-diffusion equation. However, when a particle is suspended in the otherwise quiescent fluid the flow is induced solely by the intensive mass transfer (which is typical at the initial stages of dissolution), or when the external flow and the natural convection are of comparable intensity, the approximation of diluted solution is not applicable. The mass transfer of a solid particle in these situations, which are typical for microgravity conditions and for nearly neutrally buoyant inclusions, is the main subject of the present communication. The use was made of the micro-convection model, based on the assumption that the density of the mixture depends solely on concentration. Spherically symmetric stationary and transient solutions were constructed and analyzed.

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