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Direct numerical simulation of single gas bubbles in pure and contaminated liquids PETER LAKSHMANAN, PETER EHRHARD — Disperse gas bubbles play an important role in many industrial applications. Knowing the rising velocity, the interfacial area, or the critical size for break-up or coalescence in different systems can be crucial for the process design. Hence, knowing the fundamental behaviour of a single bubble appears mandatory for the examination of bubble swarms and for the Euler-Lagrange or Euler–Euler modelling of disperse systems. In the present work a level–set–based volume–tracking method is implemented into the CFD–code OpenFOAM to follow the free interface of a single bubble. The volume-tracking method is coupled with a transport model for surfactants on the interface, including adsorption and desorption processes. The dependency of surface tension on the local surfactant concentration on the interface is modelled by a non-linear (Langmuir) equation of state. Marangoni forces, resulting from surface tension gradients, are included. The rise of a single air bubble (i) in pure water and (ii) in the presence of surfactants of different strengths is simulated. The results show good agreement with available (experimental and theoretical) correlations from literature.

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