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Formation of dynamic particle accumulation structures in oscillatory thermocapillary flow in liquid bridges DIETRICH SCHWABE, ALEXEY MIZEV, MURUGESIAN UDHAYASANKAR, University of Giessen, SHIHO TANAKA, Tokio Science University, J-L-U TEAM, TUS TEAM — We report on the behaviour of small particles of dilute concentration in time-dependent (oscillatory) thermocapillary flow in cylindrical liquid bridges (LB). For certain aspect ratios and Marangoni numbers particles are found to accumulate in a dynamic particle string. This was observed for isodense particles and for ones with density larger and smaller than that of the fluid. The particle string is wound m times (m = mode number of the oscillatory flow field) around the thermocapillary vortex as a deformed spiral and is rotating around its ring-axis. We present a hypothesis about the mechanisms of PAS-formation. Particles in the outer layers of the surface flow are gathered by the cold phase of the hydrothermal wave (HTW) and particle-rich fluid is injected in m azimuthally travelling spots into the return flow. PAS occurs for resonance between the HTW and the “turn over time of the PAS-string” in the thermocapillary vortex. Repeated in-phase injection of particle-rich fluid at the m rotating spots forms PAS. We present evidence for the gathering of particles and the injection mechanism. We varied particle radius and density to measure the time for the formation of PAS and discuss particle migration. Experiments under microgravity excluded gravity as PAS-forming mechanism. *Supported by ESA and BMBF under DLR-contract No. 50WM0350.

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