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Three-dimensional oscillatory thermocapillary convection in liquid bridge under microgravity. (English) [Zbl 1015.76073](#)

Int. J. Heat Mass Transfer 44, No. 19, 3765-3774 (2001).

Summary: Three-dimensional oscillatory thermocapillary convection in silicone oil liquid bridge is studied numerically by means of finite volume method. The results reveal the existence of two different oscillatory modes: pulsating and rotating oscillations. Close to the onset of oscillation, the pulsating oscillatory convection is observed. With the increment of Marangoni number Ma , the pulsating oscillatory convection is replaced by rotating oscillatory convection, where the temperature and velocity fields demonstrate the characteristics of rotation. An approximately linear relationship between Ma and dimensionless main frequency f^* is found for aspect ratio height-to-radius of liquid bridge $As = 4.0$ in periodic oscillatory regime. This relationship becomes a little more complex for $As = 1.0$.

MSC:

[76R05](#) Forced convection

[76D45](#) Capillarity (surface tension) for incompressible viscous fluids

[80A20](#) Heat and mass transfer, heat flow (MSC2010)

[76M12](#) Finite volume methods applied to problems in fluid mechanics

Cited in **2** Documents

Keywords:

microgravity; Marangoni convection; floating zone; three-dimensional oscillatory thermocapillary convection; silicone oil liquid bridge; finite volume method; pulsating oscillatory convection; rotating oscillatory convection

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