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Longwave Marangoni instability in a binary-liquid layer with deformable interface in the presence of Soret effect. The case of a finite Biot number[1] A. ORON, A. PODOLNY, A. A. NEPOMNYASHCHY, Technion- Israel Institute of Technology, Haifa, ISRAEL — We investigate the long-wave Marangoni instability in a binary-liquid layer with a deformable interface in the limit of a finite Biot number B and a specified heat flux at the solid substrate and in the presence of the Soret effect. In the fundamental case (a) of both finite Galileo and Lewis numbers, G and L, respectively, and a large inverse capillary number S, both monotonic and oscillatory instabilities are present. The monotonic instability takes place with the critical Marangoni number $M_{mon} = 48\,L\,\chi^{-1}$, where χ is the Soret (separation) number when $-1 < \chi < 0$. When $(1+\chi)/\chi > 0$, this instability emerges if $L < L_* = \chi B(1+\chi)^{-1}/15$. The oscillatory instability takes place with the critical Marangoni number depending on the scaled wavenumber of the disturbance K, given by $M_{osc} = (G + 3L + K^2 S)\chi^{-1}$, for disturbances with a sufficiently long wavelength when $G < 45L$. Both types of instability emerge also when (b) G, L, S are all finite; and (c) both G and L are small and S is finite. A set of nonlinear evolution equations has been derived in both cases (a) and (c).

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