

Abstract Submitted  
for the DFD05 Meeting of  
The American Physical Society

Sorting Category: 14. (T)

**Longwave Marangoni instability in a binary-liquid layer with deformable interface in the presence of Soret effect. The case of a finite Biot number**<sup>1</sup> 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  $\chi$  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).

<sup>1</sup>The research is partially supported by the Israel Science Foundation, Grant 31/03-15.3.

Prefer Oral Session  
 Prefer Poster Session

A. Oron  
meroron@tx.technion.ac.il  
Technion- Israel Institute of Technology

Date submitted: 04 Aug 2005

Electronic form version 1.4