Stability analysis of an evaporating binary mixture[1] HATIM
MACHRAFI, University of Liège, ALEXEY REDNIKOV, PIERRE COLINET,
Universite Libre de Bruxelles, PIERRE DAUBY, University of Liège — Rayleigh-
Bénard-Marangoni instabilities in an evaporating binary mixture, consisting of a
solvent and a solute of weak concentration, are studied theoretically. Local thermo-
dynamic equilibrium is assumed at the flat gas-liquid interface. Solvent evaporation
and air absorption in the liquid are neglected. At a certain height above the inter-
face, the temperature and the concentration are fixed. One of the goals of the study
is to track down the effects of this artifact on the results. Non-linear quasi-stationary
basic profiles (due to evaporation) of the temperature and the solute concentration
in the gas phase are considered, while the temperature distribution in the liquid
is assumed to be linear and quasi-stationary. For the solute concentration in the
liquid phase, two variants of the reference solution are studied, one just linear and
quasi-stationary, whereas the other involves a fully transient non-linear profile. The
latter is a more realistic option, given the relatively slow diffusion time in the liq-
uid. A linear stability analysis is then carried out numerically, and illustrated for
an aqueous solution of ethyl alcohol.

Hatim Machrafi
University of Liège

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