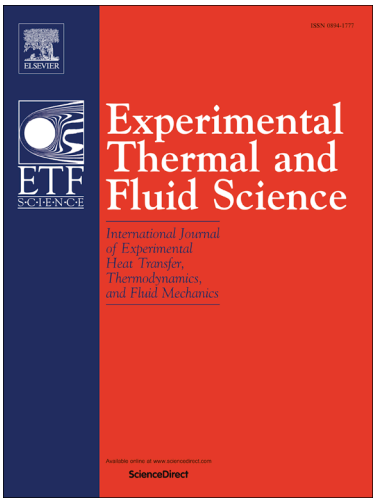

An accurate optical method for the measurement of contact angle and interface shape of evaporative thin liquids films

L. Tachon, S. Guignard

PII: S0894-1777(17)30243-1
DOI: http://dx.doi.org/10.1016/j.expthermflusci.2017.08.011
Reference: ETF 9179

To appear in: *Experimental Thermal and Fluid Science*

Received Date: 20 October 2015
Revised Date: 7 April 2017
Accepted Date: 11 August 2017

Please cite this article as: L. Tachon, S. Guignard, An accurate optical method for the measurement of contact angle and interface shape of evaporative thin liquids films, *Experimental Thermal and Fluid Science* (2017), doi: http://dx.doi.org/10.1016/j.expthermflusci.2017.08.011

Noname manuscript No.
(will be inserted by the editor)

An accurate optical method for the measurement of contact angle and interface shape of evaporative thin liquids films

L.Tachon · S.Guignard

Received: date / Accepted: date

Abstract The aim of this study was to present an original method to compute the shape of the interface in the vicinity of the contact line after liquid film breakup. The liquid film is a controlled volume of evaporating liquid (HFE7100) filling a millimetric cylindrical vertical well. During the evaporation process, the liquid-gas interface takes on a toroidal shape delimiting an axisymmetric liquid meniscus (together with the well bottom and side walls). The first step of the evaporation process occurs without a contact line on the bottom and is followed, in the second step, by the creation and growth of a dry patch delimited by a circular contact line on the well bottom. The shape of the meniscus interface and the position of the contact line are instantaneously measured by laser sheet sounding from below and numerical inversion. This technique determines the variation of the light intensity of a laser sheet due to its refraction through consecutive interfaces (solid-liquid-vapor).The intensity of the laser sheet impact on a perpendicular screen is inverted. The inversion results provide the shape of the interface and the position of the contact line during the evaporation process. By this new method contact angles between 2 and 40 degrees can be measured and the interface shape can be obtained with high accuracy. This method is specially adapted for concave shape, as meniscus, where side view is not possible. It is perfectly complementary with the other classical methods (e.g., interferometry and goniometry).

Keywords thin liquid film · contact angle · contact line · evaporation · optical method

L. Tachon
Laboratoire IUSTI, Technople de Chteau-Gombert, 5 rue Enrico Fermi, 13453 Marseille Cedex 13, FRANCE
Tel.: +33-4-91106936
Fax: +33-4-91106969
E-mail: dr.loic.tachon@gmail.com

S. Guignard
Tel.: +33-4-91106914
Fax: +33-4-91106969
E-mail: guignard@polytech.univ-mrs.fr