SIS 2010

18th International Symposium on Surfactants in Solution

Sebel Hotel, Albert Park, Melbourne, Australia
14-19 NOVEMBER 2010

Proceedings

Enter

www.sis2010.org.au

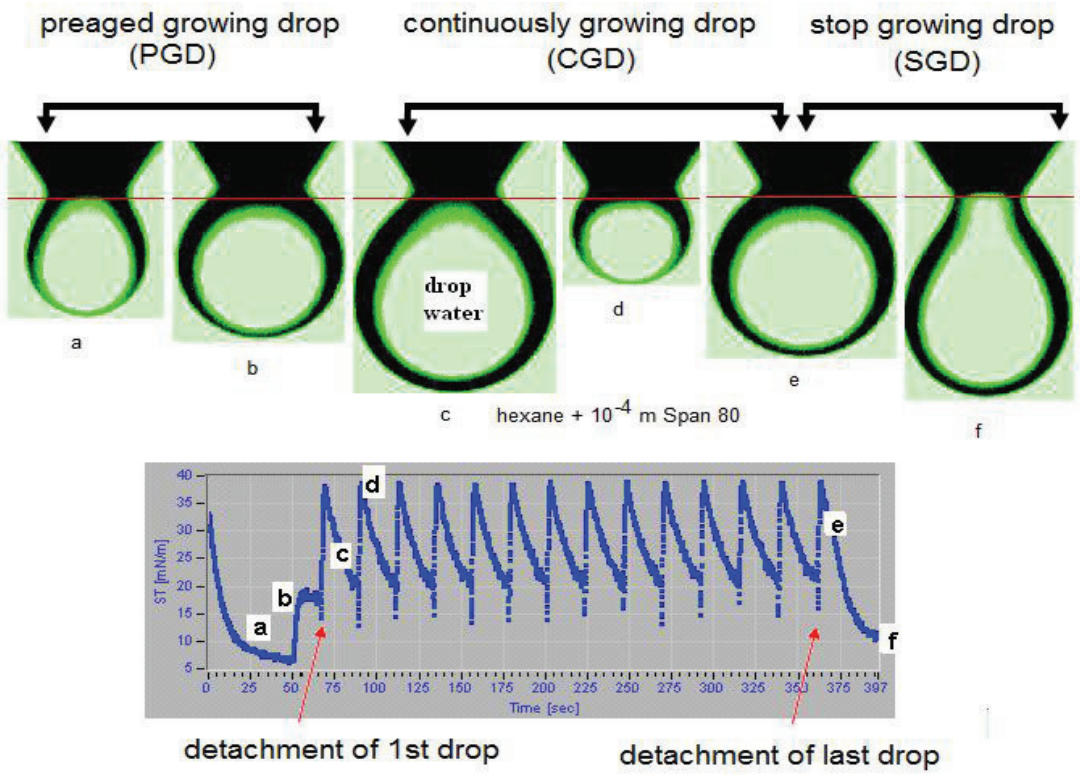
227

SHORT TIME DYNAMIC INTERFACIAL TENSION AS MEASURED WITH CAPILLARY PRESSURE TECHNIQUE

J. Kraegel[1], A. Javadi[1], P. Pandolfini[2], G. Loglio[2], N. M. Kovalchuk[3], V. I. Kovalchuk[3], F. Ravera[4], L. Liggieri[4], R. Miller[1]

[1]Interfaces, Max-Planck-Institute of Colloids and Interfaces, Potsdam-Golm, Germany
[2]University of Florence, Sesto Fiorentino (Firenze), 50019, Italy
[3]Institute of Biocolloid Chemistry, Kiev, 03680, Ukraine
[4]CNR - Istituto per la Energetica e le Interfasi, Genoa, 16149, Italy

Dynamic interfacial tension measurements in the short time range are a major request for controlling interfacial processes in modern, highly dynamic technologies. Capillary pressure measurements for growing and oscillating drops represent a good way to fulfil these requirements. The corresponding quantitative data analysis, however, requires the solution of rather complex theories on the hydrodynamics of growing drops and the adsorption dynamics at the drop surface and possible mass transfer across interfaces for liquid/liquid systems. The present contribution gives an introduction into capillary pressure experiments, based on three different experimental protocols: 1- Pre-aged Growing Drop (PGD), 2- Stopped Growing Drop (SGD) and 3- Continuously Growing Drop (CGD). Due to the occurring maximum in capillary pressure, CGD can be seen as equivalent to maximum bubble pressure tensiometry but for liquid/liquid interfaces. While large droplet surface area changes in CGD procedure is an important benefit, the much more complicated theoretical description of the adsorption process at the surface of a growing drop is a significant drawback. The PGD protocol with growing drops from a well knows initial state is complementary to CGD. In contrast, the SGD protocol with a pre-sized fresh droplet works in absence of hydrodynamics effects, and data analysis is based on the well-known Ward-Tordai model, adapted to a spherical interfacial geometry. The different protocols are demonstrated for adsorption layers of different surfactants at the water/hexane interface. In addition high speed video monitoring of drop shapes allows defining the limits for the applicability of various dynamic drop techniques. It is shown that the self-oscillations of a remnant drop after drop detachment is influenced by the adsorption process. The role of surfactants in such highly dynamic processes and the impact on the experimental limits is discussed on the basis of some model systems the basic properties of which are well known under less dynamic or quasi-static conditions. Experimental protocols for the capillary pressure tensiometer shown in Fig. 8; stages a and b: pre-aged growing drop (PGD); stages c and d: continuously growing drop (CGD); stages e and f: stop growing drop (SGD) protocol; according to Javadi A. etal. [1].



(1) Javadi A., Krägel J., Pandolfini P., Loglio G., Kovalchuk V.I., Aksenenko E.V., Ravera F., Liggieri L., Miller R., Colloids Surfaces A, 365 (2010) 62