Supplementary Material

Deviations Between the Experimental Pendant-Bubble Dynamic Surface Tension Data and the Diffusion-Controlled Model Fits

Three Features Suggesting the Possible Existence of Convective Currents at Time Scales Greater than 100 Seconds

- **Feature 1**: Whenever a significant percentage reduction in the dynamic surface tension takes place at time scales *smaller than 100 seconds*, there is good agreement between the experimental pendant-bubble dynamic surface tension (DST) data and the diffusion-controlled model fits.
- **Feature 2**: Whenever a significant percentage reduction in the dynamic surface tension takes place at time scales *greater than 100 seconds* (indicated by the yellow regions), there is relatively poor agreement between the experimental pendant-bubble DST data and the diffusion-controlled model fits.
- **Feature 3**: Whenever a significant reduction in the dynamic surface tension takes place at time scales *greater than 100 seconds* (indicated by the yellow regions), the experimental DST data reduces at a rate which is faster than that predicted by the diffusion-controlled model at long times (indicated by the blue colored ovals).

Percentage Reduction in the Dynamic Surface Tension:

$$\frac{\gamma_{w/a} - \gamma(t)}{\gamma_{w/a} - \gamma_e} \times 100$$

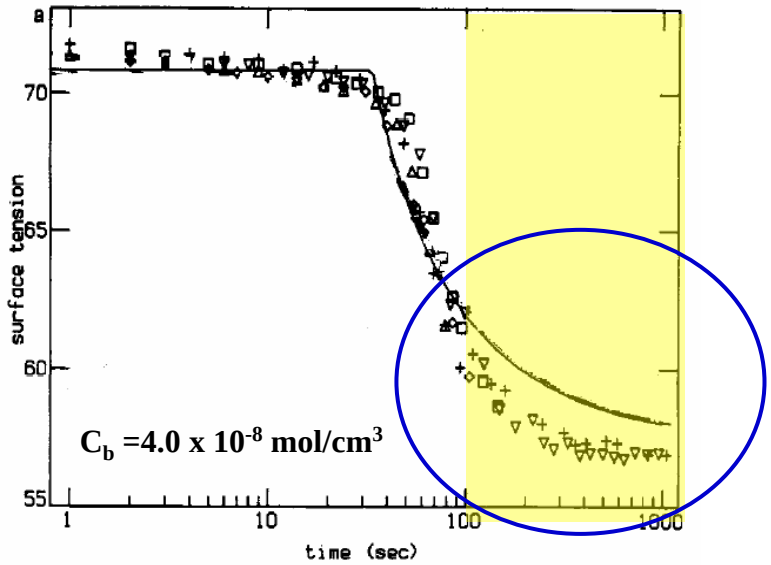
$\gamma_{w/a}$ Water/air surface tension

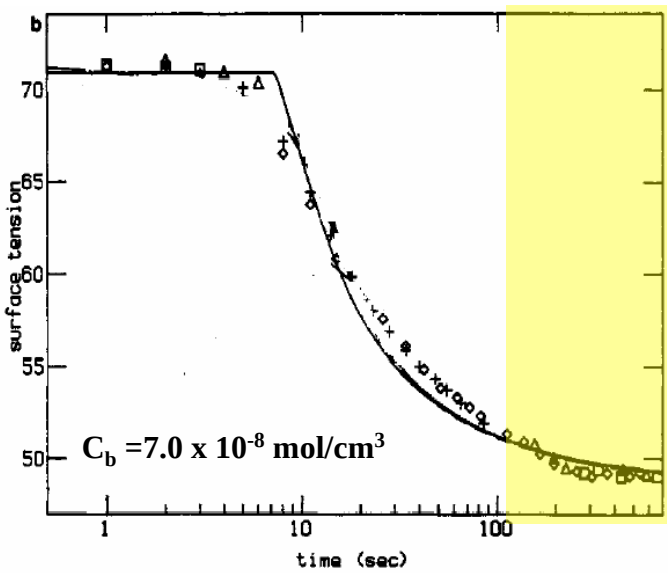
$\gamma(t)$ Instantaneous surface tension at time *t*

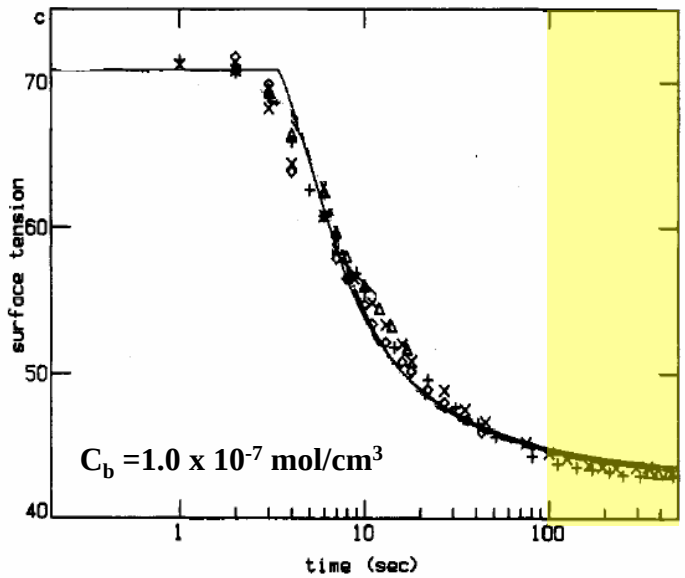
γ_e Equilibrium surface tension

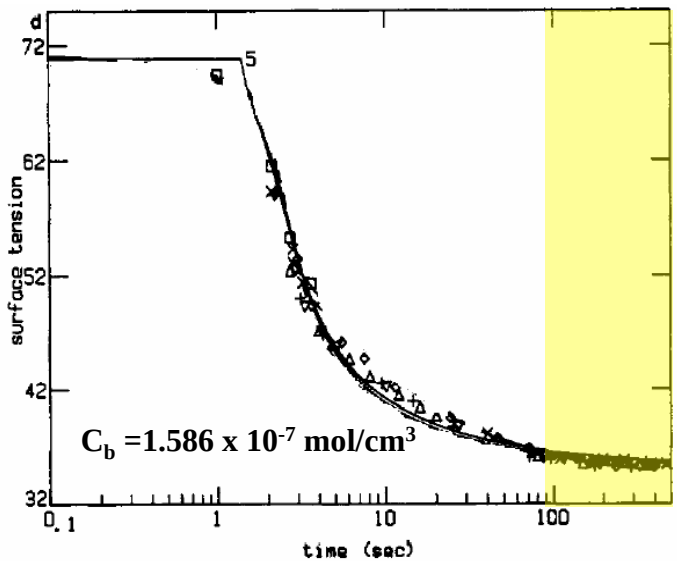
Surfactant:	Decanol
Equilibrium Adsorption Model Used:	Phase Transition Model
Reference:	S-Y. Lin, K. Mckeigue, and C. Maldarelli, Langmuir, 7, 1055-1066, 1991.

Adapted from Figure 3



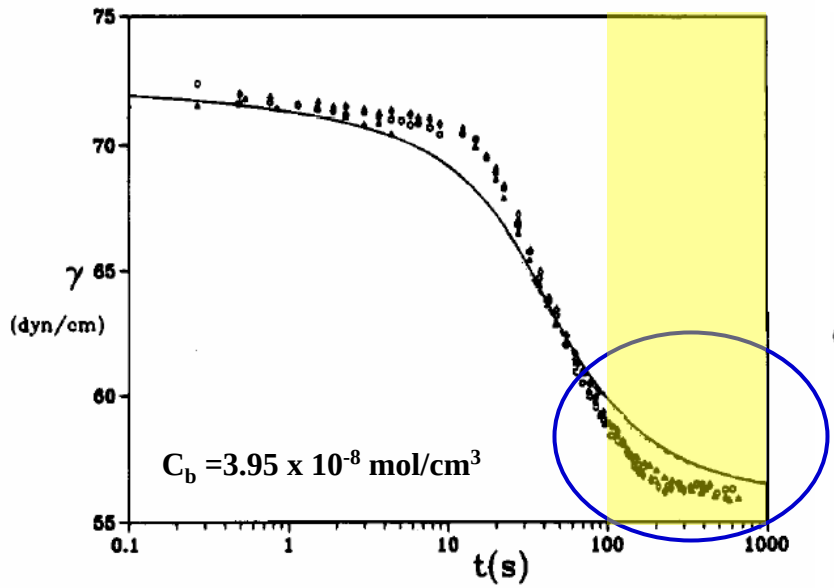


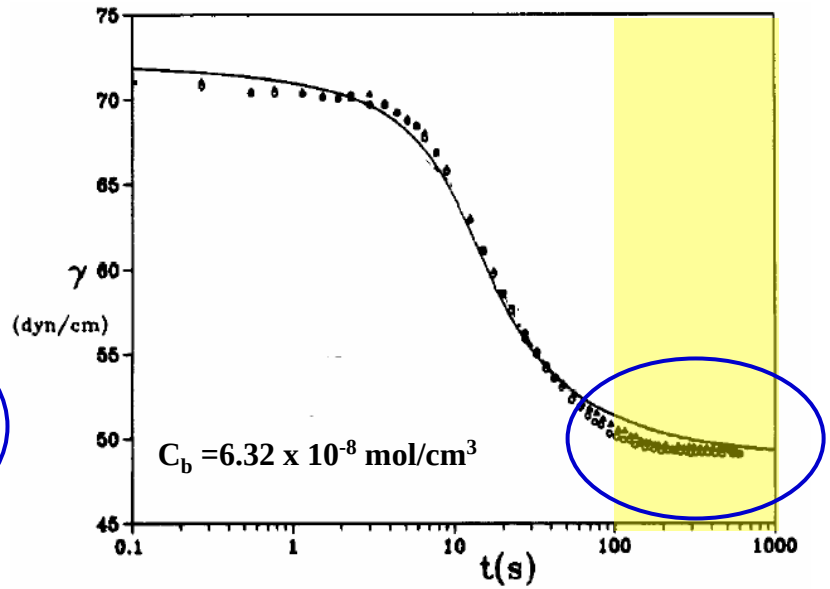


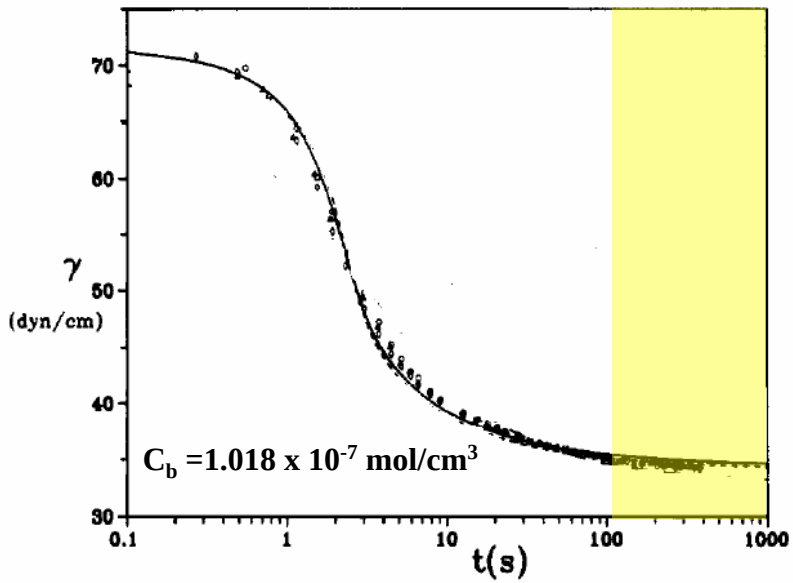


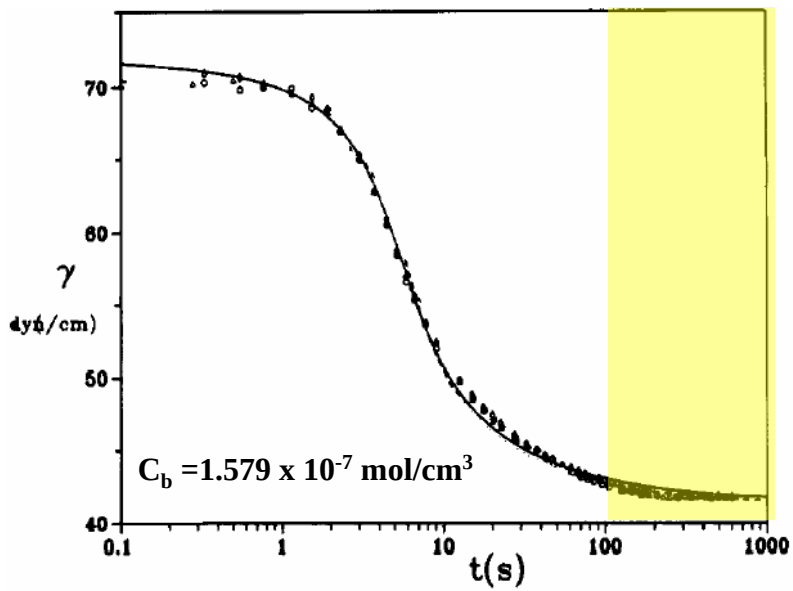
Surfactant:	Decanol
Equilibrium Adsorption Model Used:	Generalized Frumkin Model
Reference:	S-Y. Lin, T-L. Lu, and W-B. Hwang, Langmuir, 11, 555-562, 1995.

Adapted from Figure 3



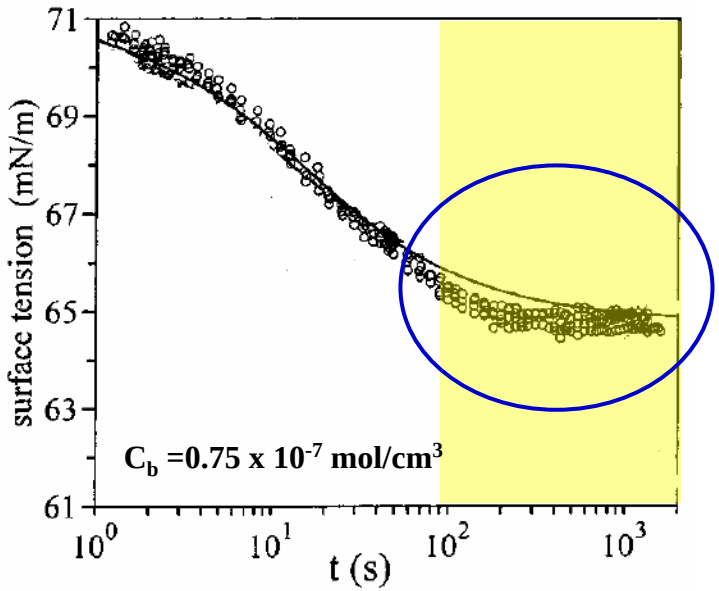


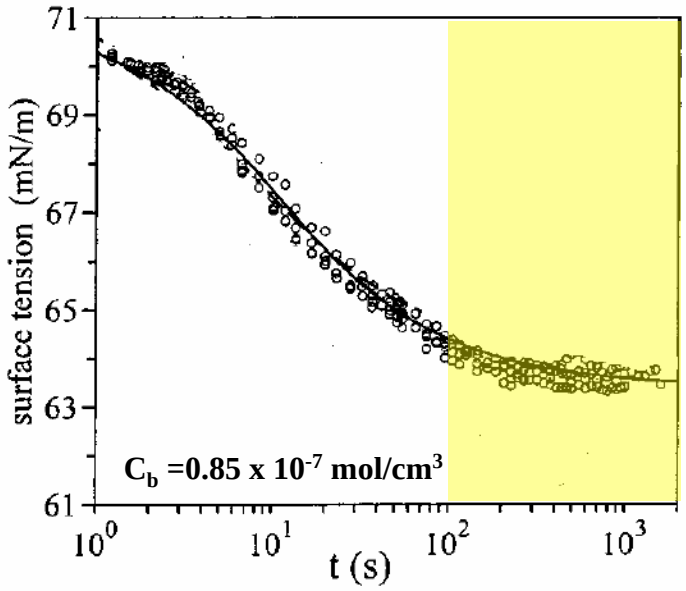


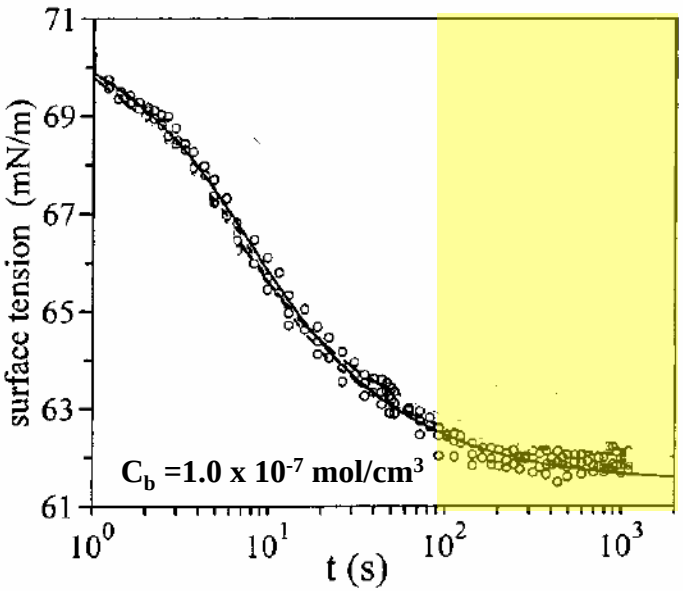


Surfactant:	Nonanol
Equilibrium Adsorption Model Used:	Generalized Frumkin Model
Reference:	Y-C. Lee, Y-B. Liou, R. Miller, H-S. Liu, and S-Y. Lin, Langmuir, 11, 555-562, 1995.

Adapted from Figure 7

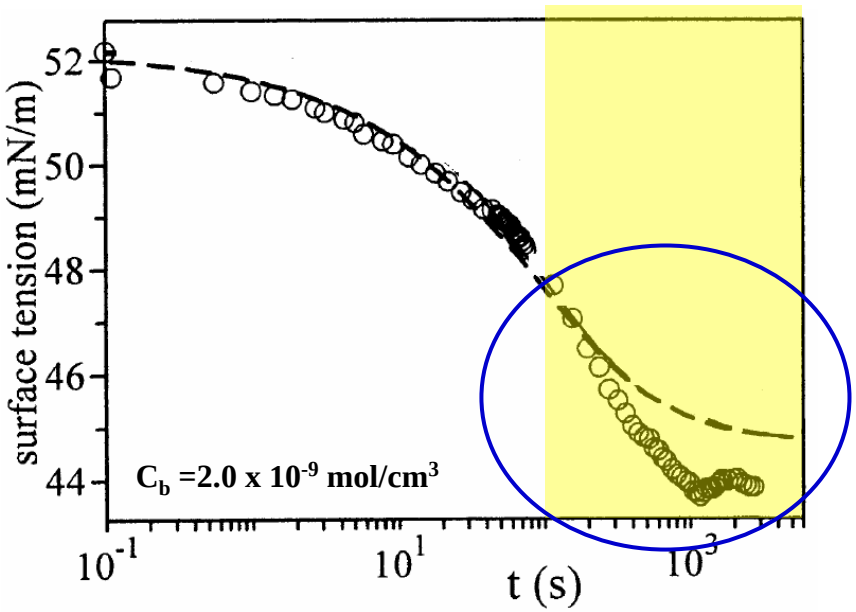




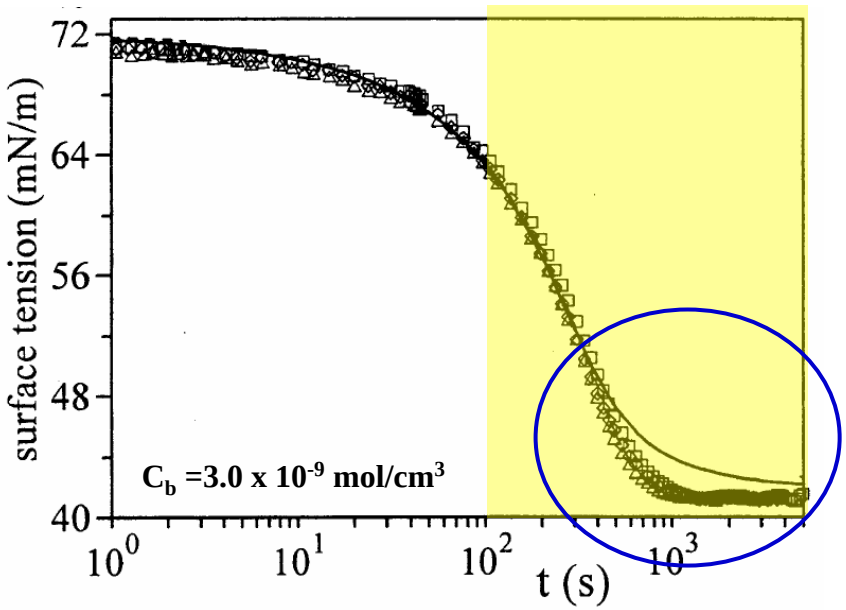


Surfactant:	$C_{14}E_8$
Equilibrium Adsorption Model Used:	Generalized Frumkin Model
Reference:	Y-C. Lee, K. J. Stebe, H-S. Liu, and S-Y. Lin, Colloids and Surfaces A: Physicochem. Eng. Aspects, 220, 139-150, 2003.

Adapted from Figure 5b

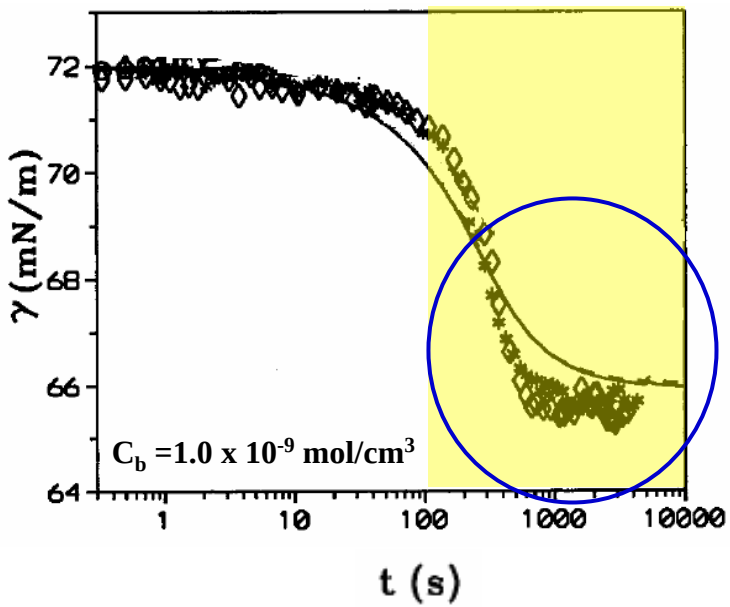


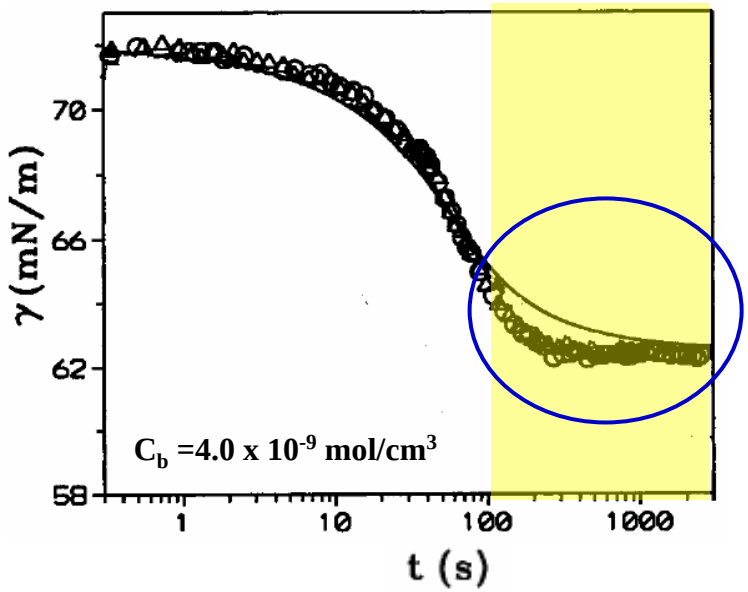
Adapted from Figure 10b

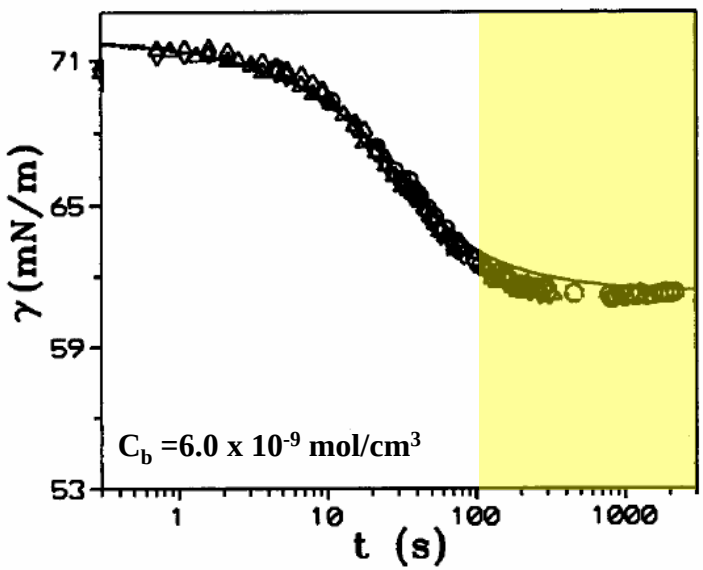


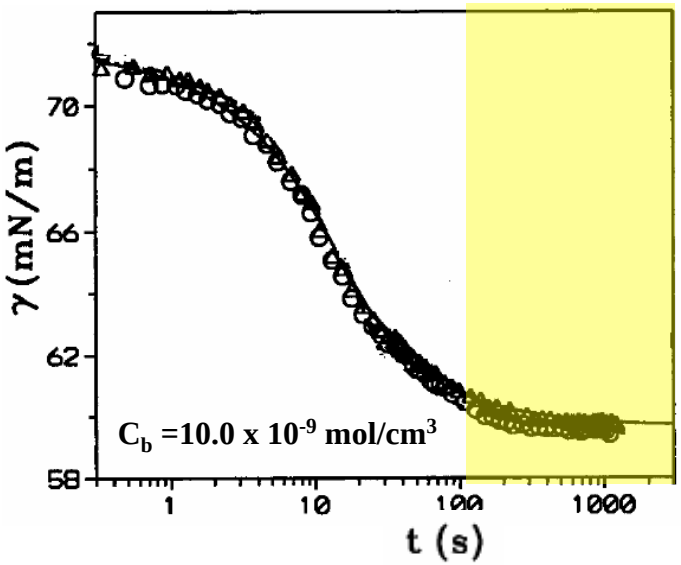
Surfactant:	$C_{10}E_8$
Equilibrium Adsorption Model Used:	Generalized Frumkin Model
Reference:	H-C. Chang, C-T. Hsu, and S-Y. Lin, Langmuir, 14, 2476-2484, 2003.

Adapted from Figure 2



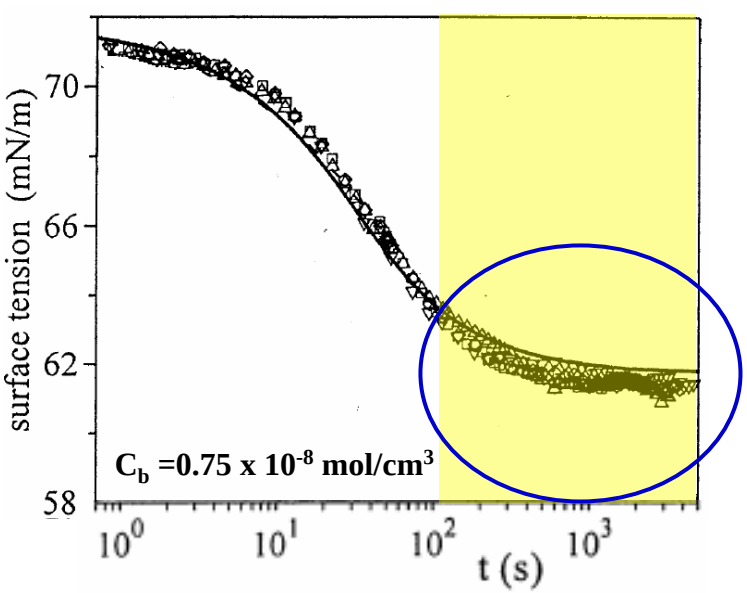


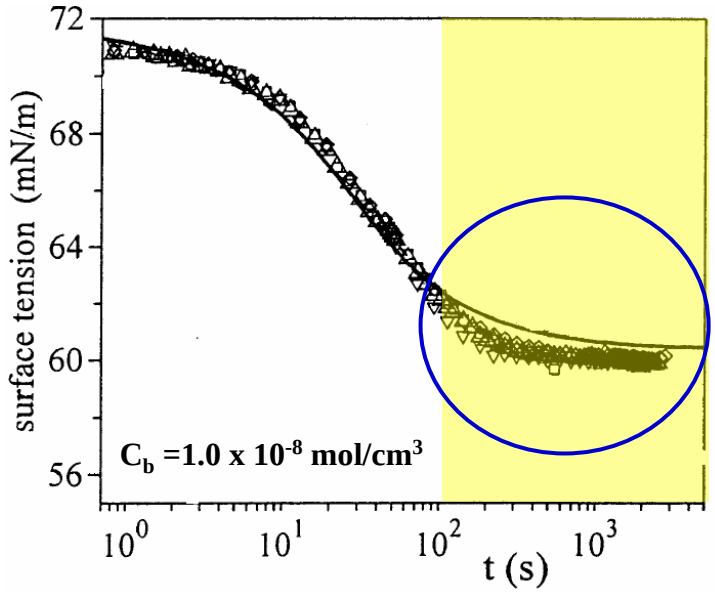


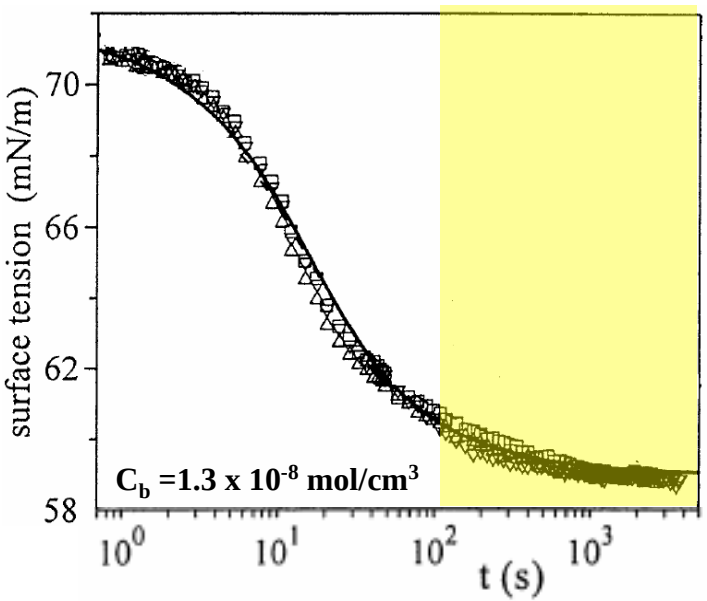


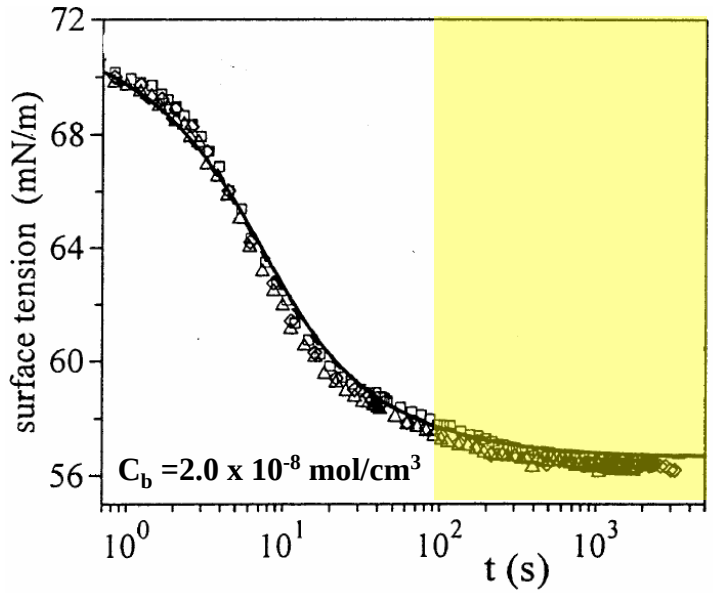
Surfactant:	$C_{10}E_4$
Equilibrium Adsorption Model Used:	Generalized Frumkin Model
Reference:	Y-C. Lee, H-S. Liu, and S-Y. Lin, Colloids and Surfaces A: Physicochem. Eng. Aspects, 212, 123-134, 2003.

Adapted from Figure 8



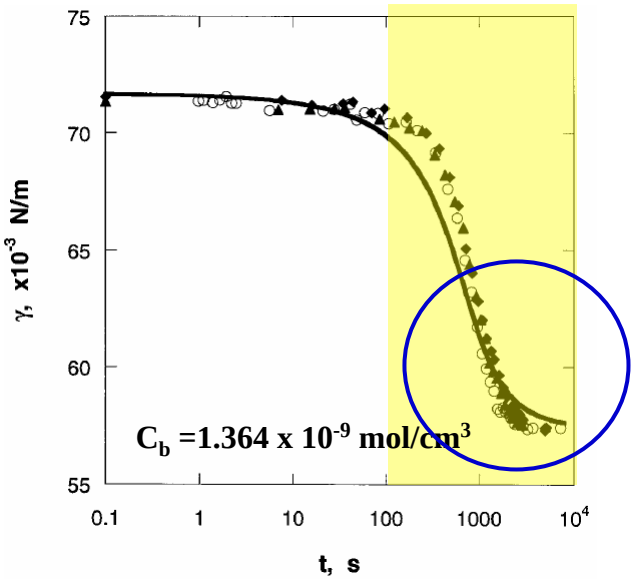




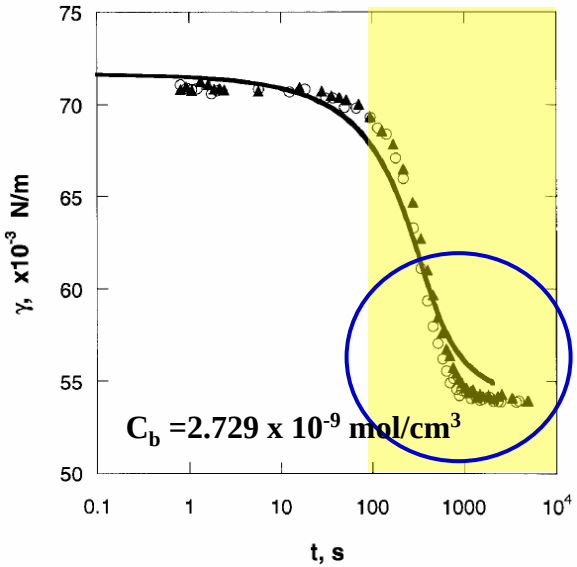


Surfactant:	$C_{12}E_6$
Equilibrium Adsorption Model Used:	Frumkin Model
Reference:	R. Pan, J. Green, and C. Maldarelli, Journal of Colloid and Interface Science, 205, 213-230, 1998.

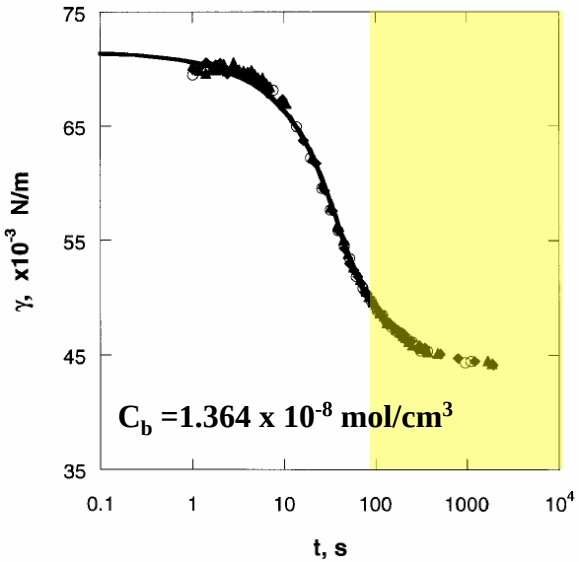
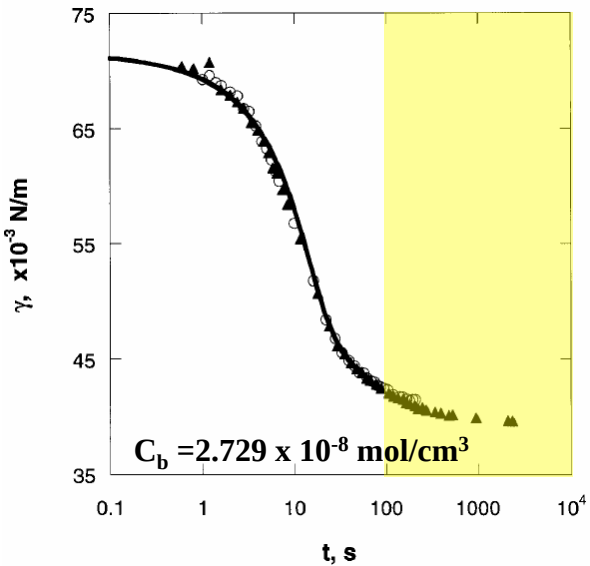
Adapted from Figure 11



Adapted from Figure 12



Adapted from Figure 13



Adapted from Figure 14