



REFERENCES

- Adamson, A.W. (1990). Physical Chemistry of Surfaces. 5th ed. Pp.11-18. USA: John Wiley & Sons.
- Chatelier, R.C., Hodges, A.M., Drummond, C.J., Chan, D.Y., and Griesser, H.J. (1997). Determination of the intrinsic acid-base dissociation constant and site density of ionizable surface groups by capillary rise measurements. Langmuir, 13, 3043-3046.
- Chibowski, E., and Perea-Carpio, R., (2002). Problems of contact angle and solid surface free energy determination. Advances in Colloid and Interface Science. Vol. 98, pp. 245-264.
- Fox, R.W., and McDonald, A.T. (1994) Introduction to Fluid Mechanics. 4th ed. pp.712-715. USA: John Wiley & Sons.
- Grzybowski, B.A., Arias, F., Yang, H., and Whitesides, G.M. (2001). Modeling of menisci and capillary forces from the millimeter to the micrometer size range. Journal of Physics and Chemistry B, 2, 404-412.
- Kwok, D.Y. *et al.*, (1996). Capillary rise at a vertical plate as a contact angle technique. A.W., Neumann, and J.K., Spelt, (Ed.). Applied Surface Thermodynamics (Surfactant Science Series Volume 63). pp.413-440. New York: Marcel Dekker.
- Lee, S., Kim, D.H., and Needham, D. (2001). Equilibrium and dynamic interfacial tension measurements at microscopic interfaces using a micropipet technique. 1.A new method for determination of interfacial tension. Langmuir, 17, 5537-5543.
- Middleman, S. (1998). An Introduction to Fluid Dynamics: Principles of Analysis and Design. USA: John Wiley & Sons.
- Miller, C.A., and Neogi, P. (1985). Interfacial phenomena: equilibrium and dynamic effects, Surfactant Science Series. Vol.17, pp.23-41. New York: Marcel Dekker.
- Rosen, M.J. (1989) Surfactant and Interfacial Phenomena. 2nd ed. John Wiley & Sons.

Scamehorn, J.F. (2002) Lecture Note on “Colloid and Surface Science”, The Petroleum and Petrochemical College, Chulalongkorn University, Bangkok, Thailand.

Strange, M. (2002). http://zarm.uni-bremen.de/2forschung/grenzph/isotherm/cap_rise/kapst_en.htm

APPENDICES

Appendix A Meniscus Heights from Mathematical and Experimental Solutions.

Table A1 Heights of meniscus at various radii with a contact angle of 22.9°

Radius	4 th -order Runge Kutta	Euler's method	Experimental results
7.00	0.000	0.000	0.000
7.17	0.067	0.066	0.063
7.40	0.157	0.154	0.147
7.59	0.229	0.223	0.211
7.70	0.269	0.260	0.253
7.80	0.308	0.295	0.294

Table A2 Heights of meniscus at various radii with a contact angle of 12.2°

Radius	4 th -order Runge Kutta	Euler's method	Experimental results
7.00	0.000	0.000	0.000
7.20	0.042	0.042	0.042
7.40	0.084	0.082	0.084
7.60	0.125	0.121	0.126
7.80	0.165	0.158	0.160

Appendix B Algorithms of Solving the Surface Curvature and the Height of the Rising Water.

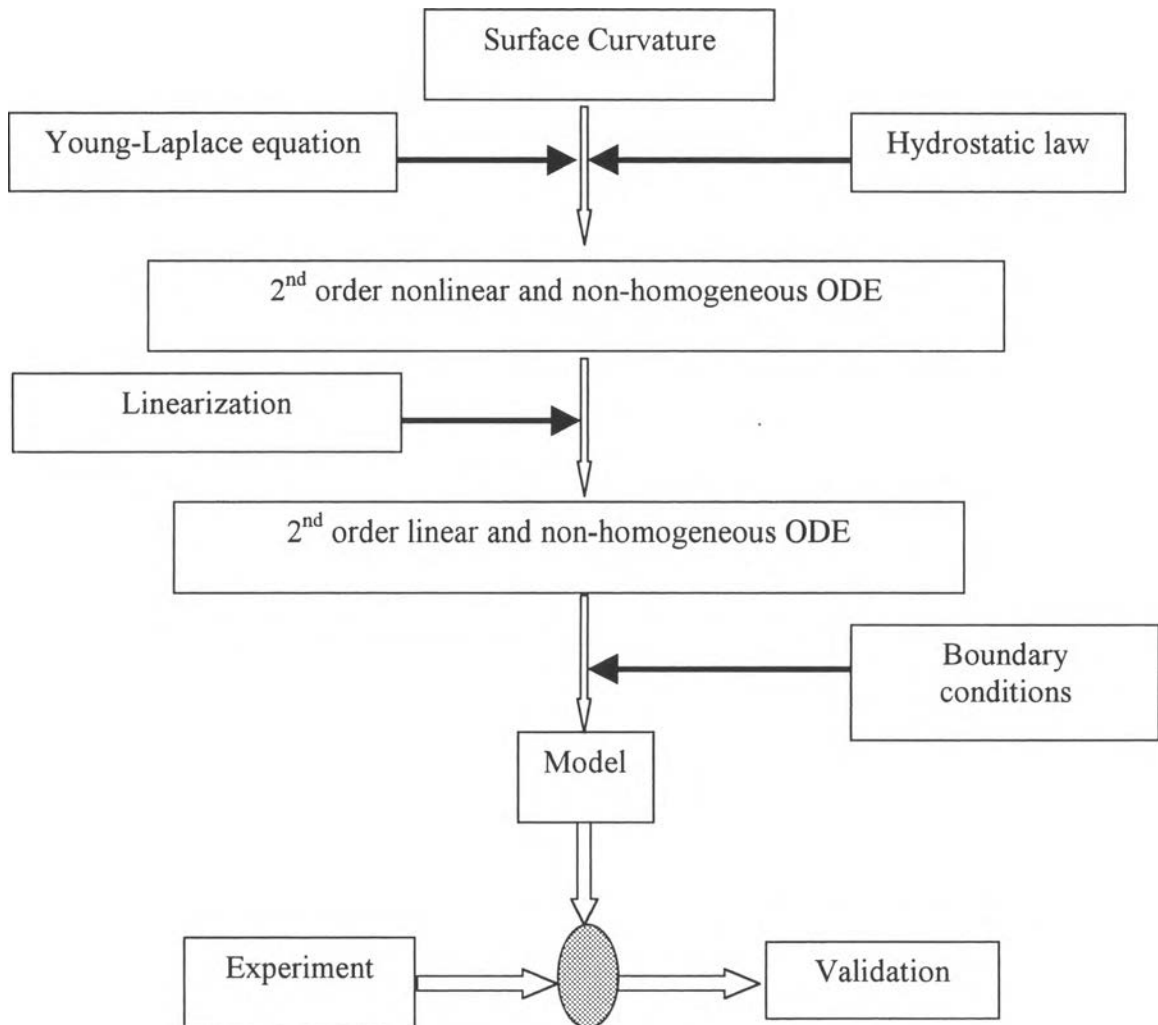


Figure B1 Block diagram for an analytical slution.

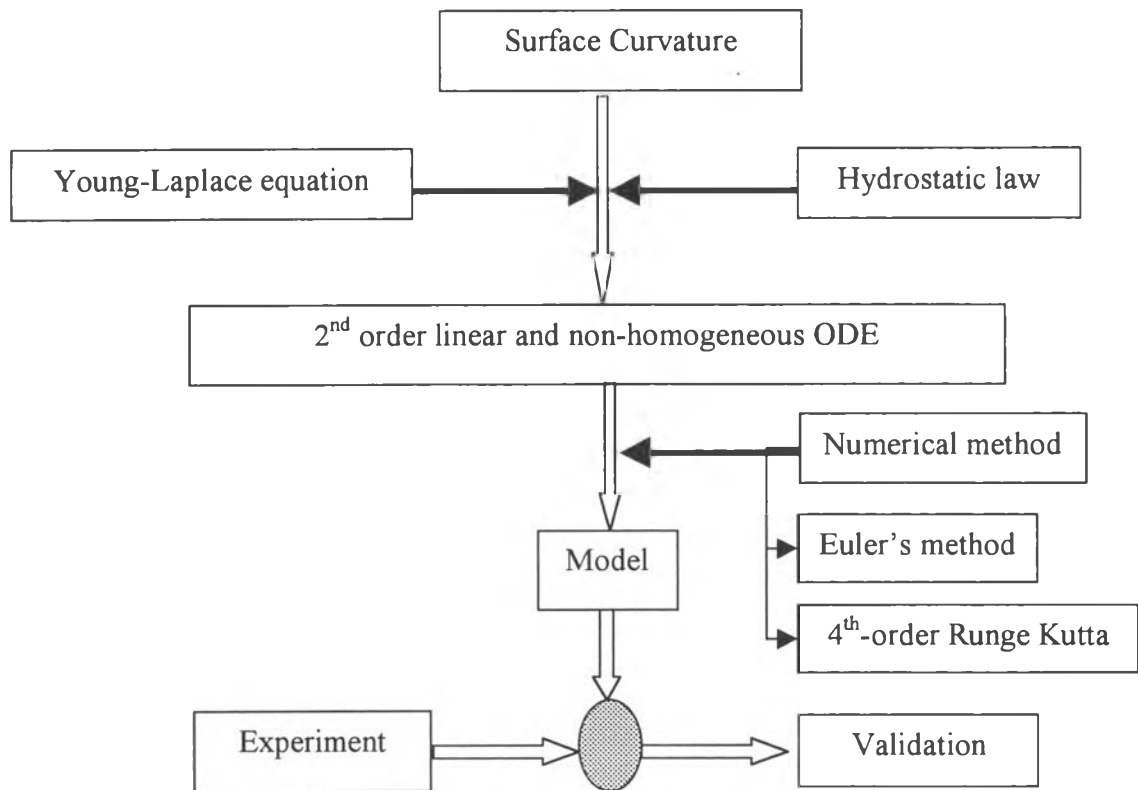


Figure B2 Block diagram for numerical solutions.

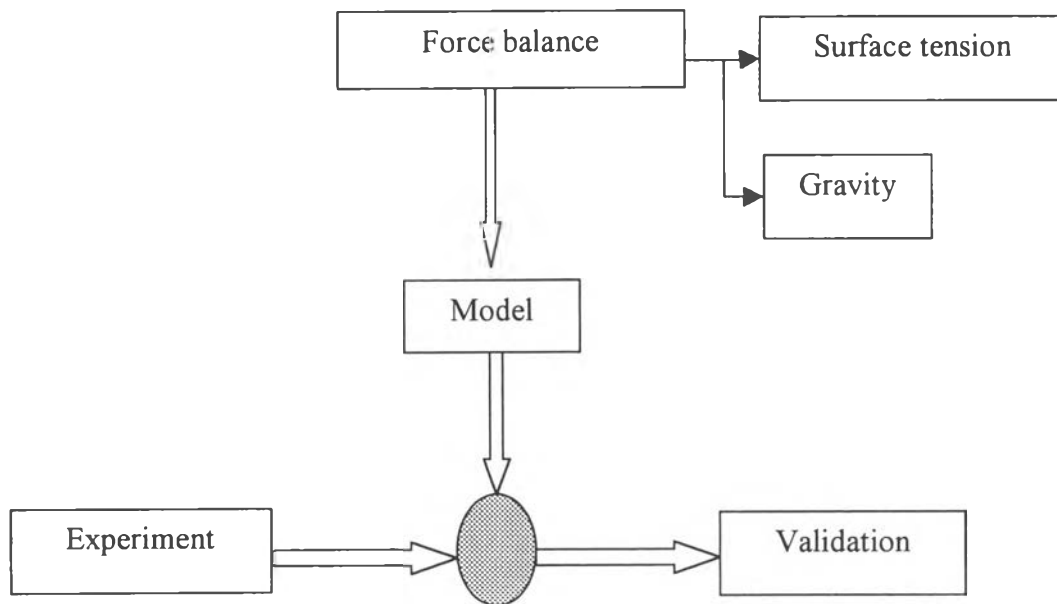


Figure B3 Block diagram for the height of a rising water.

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Presentations and publications

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2. Panmaluak, W., Rangsunvigit, P., Siemanond, K., and O’Rear, E.A. (2002). Menisci for Various Liquids and Solid Surfaces for Capillary Rise in an Annular Tube. Proceedings of The National Conference of Chemical Engineering, November 8-9, Bangkok, Thailand.

