

Volume 107 (1997)

Progress in

Analytical Ultracentrifugation IV

Guest Editors:

R. Jaenicke and

H. Durchschlag (Regensburg)

This volume contains the contributions of the 10th Symposium on Analytical Ultracentrifugation, held in Regensburg on March 13th and 14th, 1997.

Topics in the following fields were presented:

- Technical Innovations
 - Innovations in Data Analysis
 - Modeling
 - Biological Systems
 - Ions and Polyelectrolytes
 - Polymers, Colloids, Supramolecular Systems
 - Emulsions, Gels, and Dispersions
 - Interacting Systems and Assemblies
-

Colloid & Polymer Science

Editors:

F. Kremer (Leipzig)

G. Lagaly (Kiel)



STEINKOPFF
DARMSTADT



Springer

PROGRESS IN COLLOID & POLYMER SCIENCE

Editors: F. Kremer (Leipzig) and G. Lagaly (Kiel)

Volume 107 (1997)

Analytical Ultracentrifugation IV

Guest Editors:

R. Jaenicke and H. Durchschlag
(Regensburg)



STEINKOPFF
DARMSTADT



Springer

ISBN 3-7985-1106-3
ISSN 0340-255 X

Die Deutsche Bibliothek –
CIP-Einheitsaufnahme

Progress in colloid & polymer science. –
Darmstadt : Steinkopff ; New York :
Springer

Früher Schriftenreihe
Vol. 107. Analytical ultracentrifugation
IV. – 1997

Analytical ultracentrifugation IV / guest ed.:
Jaenicke and Durchschlag. – Darmstadt :
Steinkopff, 1997

(Progress in colloid & polymer science ;
Vol. 107)

ISBN 3-7985-1106-3

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically those rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in other ways, and storage in data banks. Duplication of this publication or parts thereof is only permitted under the provisions of the German Copyright Law of September 9, 1965, in its version of June 24, 1985, and a copyright fee must always be paid. Violations fall under the prosecution act of the German Copyright Law.

The use of registered names, trademarks, etc. in this publication does not imply, even in the absence of specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

© 1997 by Dr. Dietrich Steinkopff Verlag
GmbH & Co. KG, Darmstadt.

Chemistry Editor:
Dr. Maria Magdalene Nabbe;
Production: Holger Frey, Ajit Vaidya.

Typesetting and Copy-Editing:
Macmillan Ltd., Bangalore, India

Printing: Druckhaus Beltz, Hemsbach

The 10th Symposium on Analytical Ultracentrifugation took place at the University of Regensburg on March 13th and 14th, 1997. More than 100 participants, among them 30 speakers, met at the Institute of Biophysics and Physical Biochemistry (Faculty of Biology and Preclinical Medicine) to discuss recent results and developments in the fields of Macromolecular Chemistry, Biophysical Chemistry, and Polymer Science from the perspective of ultracentrifugal analysis. In the present volume of Progress in Colloid & Polymer Science selected topics from the lectures and posters have been collected in order to give an overview over the present state of the art in ultracentrifugation at the turning point from the preferably manual to the fully computerized methodology.

It has been a festive occasion to host the ultracentrifuge community in Regensburg again after a pause of 12 years. Clearly, the 10th Symposium had to be put into an appropriate historical frame. Insiders know that it was Cassius and not Marcus Aurelius, the founder of Regensburg, who inspired Svedberg to develop the ultracentrifuge, but there are some hidden connections between the venerable 27 years of history of the University and Svedberg's method: many of the grand old men from the heroic age of biophysical chemistry have been frequent guests (and even guest professors) in Regensburg, to mention only three: Heini Eisenberg, Max A. Lauffer, and Howard K. Schachman. Apart from these highlights in the grey everyday life of the faculty, there are more historical monuments. In the Institute of the hosts, the veteran of the Spinco E's in this country still survives, and two more of the old-timer generation have been in use around the clock for 25 years. The user (himself close to the age of Svedberg's ingenious first air-driven machine) enjoys his hobby-dinosaurs, and the co-organizer of the Symposium shares his enthusiasm. Not that both would not like to do comparative studies with the XL-A or XL-I, but some surprise has to be left for the next Regensburg Symposium, perhaps after another 12 years.

As in the case of the previous nine meetings, the 1997 Symposium attracted researchers from universities, research institutes, and industrial companies. The highlights which gave the 10th meeting its jubilee flavor were the keynote lectures given by Professors Donald J. Winzor and Allen P. Minton. They not only set the frame and the standards, but also gave the whole conference a very stimulating atmosphere. The organizers would like to thank both speakers for accepting the invitation and contributing to this special issue. Inviting speakers from Australia and the United States was only possible thanks to the financial support from a number of sponsors:

BASF AG, Ludwigshafen
Beckman Instruments GmbH, Munich
Biacore AB, Freiburg
Merck KGaA, Darmstadt
Pharmacia Biotech Europe GmbH, Freiburg
Regensburger Universitätsstiftung Hans Vielberth

Their generosity is gratefully acknowledged. We owe special thanks to the Regensburger Universitätsstiftung Hans Vielberth; without its help we would not have been able to organize this meeting.

The present volume of Progress in Colloid & Polymer Science contains contributions on the following topics:

Technical Innovations
Innovations in Data Analysis
Modeling
Biological Systems
Ions and Polyelectrolytes
Polymers, Colloids, Supramolecular Systems
Emulsions, Gels, and Dispersions
Interacting Systems and Assemblies

We hope that the rapid publication of the Proceedings helps to enhance the awareness of our colleagues in Physical Chemistry, Biophysics, Biochemistry and Polymer Science that a new era in the characterization of macromolecules has started with the recent renaissance of analytical ultracentrifugation in many fields of research. In this context we should like to thank the editor Dr. M. M. Nabbe for her support in preparing this volume.

Regensburg, July 1997

R. Jaenicke
H. Durchschlag

	Preface	V
	Keynote lectures	
P. R. Wills, M. P. Jacobsen, D. J. Winzor:	Direct analysis of sedimentation equilibrium distributions reflecting macromolecular interactions	1
A. P. Minton:	Alternative strategies for the characterization of associations in multi-component solutions via measurement of sedimentation equilibrium ...	11
	Data analysis	
E. K. Dimitriadis, M. S. Lewis:	Non-linear curve-fitting methods for data from the XL-A analytical ultracentrifuge	20
J. Behlke, O. Ristau:	Rapid molecular mass determination by sedimentation velocity experiments and direct fitting of the concentration profiles	27
H. Cölfen, D. J. Winzor:	A computer program based on the psi function for model-independent analysis of sedimentation equilibrium distributions reflecting macromolecular interactions	36
	Modeling	
H. Durchschlag, P. Zipper:	Calculation of hydrodynamic parameters of biopolymers from scattering data using whole-body approaches	43
P. Zipper, H. Durchschlag:	Calculation of hydrodynamic parameters of proteins from crystallographic data using multibody approaches	58
	Biological Systems	
M. Pitschke, K. Post, D. Riesner:	Analytical ultracentrifugation with fluorescence detection and biosafety containment and its application to the prion protein	72
F. Dölle, D. Schubert:	Dye-labelling as a means to study ternary protein complexes by analytical ultracentrifugation: The band 3/ankyrin/aldolase complex from erythrocyte membranes	77
M. P. Jacobsen, D. J. Winzor:	Studies of ligand-mediated conformational changes in enzymes by difference sedimentation velocity in the Optima XL-A ultracentrifuge	82
J. Vanhoudt, T. Aerts, S. Abgar, J. Clauwaert:	Quaternary structure and interaction parameters of bovine α -crystallin: Influence of isolation conditions	88
C. Fochler, H. Durchschlag:	Investigation of irradiated eye-lens proteins by analytical ultracentrifugation and other techniques	94
K.-J. Tiefenbach, H. Durchschlag, R. Jaenicke:	Sedimentation analysis of SDS and albumin-SDS complexes	102
H. Wendt, R. M. Thomas:	The self-association of basic helix-loop-helix peptides	115
Ch. Bartmann-Lindholm, M. Geisert, U. Güngerich, W. E. G. Müller, D. Weinblum:	Nuclear DNA fractions with grossly different base ratios in the genome of the marine sponge <i>Geodia cydonium</i>	122

Polymers, Colloids, and Supramolecular Systems

E. Görnitz, M. Hahn, W. Jaeger, H. Dautzenberg:	Sedimentation equilibrium studies of synthetic polyelectrolytes by means of interference optical methods	127
H. Cölfen, T. Pauck, M. Antonietti:	Investigation of quantum size colloids using the XL-I ultracentrifuge . .	136
M. D. Lechner, W. Mächtle, U. Sedlack:	Influence of pressure and solvent composition on the density gradient in the analytical ultracentrifuge. I. Extended <i>Hermans-Ende</i> equation for the equilibrium density gradient	148
M. D. Lechner, W. Mächtle, U. Sedlack:	Influence of pressure and solvent composition on the density gradient in the analytical ultracentrifuge. II. Direct refractometric determination of the equilibrium and non-equilibrium density gradient	154
P. Rossmanith, W. Mächtle:	First experiences with the new XL-I AUC: Applications in polymer and colloid science	159
D. Schubert, J. A. van den Broek, B. Sell, H. Durchschlag, W. Mächtle, U. S. Schubert, J.-M. Lehn:	Analytical ultracentrifugation as a tool in supramolecular chemistry: A feasibility study using a metal coordination array	166

Gels, Emulsions, and Dispersions

W. Borchard, H. M. Hinsken:	The sedimentation velocity of a gel	172
H. G. Müller:	New contributions of analytical ultracentrifugation to the investigation of dispersions	180
P. M. Budd, R. K. Pinfield, C. Price:	Determination of hydrodynamic radius: A comparison of ultracentrifuge methods with dynamic light scattering	189

Author Index	193
-------------------------------	-----

Subject Index	194
--------------------------------	-----