NMR Spectroscopy in the Undergraduate Curriculum: Upper-Level Courses and Across the Curriculum Volume 3



Library of Congress Cataloging-in-Publication Data

NMR spectroscopy in the undergraduate curriculum: upper-level courses and Across the Curriculum Volume 3 / David Soulsby, editor,
University of Redlands, Redlands, California, Laura I. Anna, editor, Montgomery

University of Redlands, Redlands, California, Laura J. Anna, editor, Montgomery College Rockville, Maryland, Anton S. Wallner, editor, Barry University, Miami Shores, Florida; sponsored by the ACS Division of Chemical Education.

pages cm. -- (ACS symposium series; 1225) Includes bibliographical references and index. ISBN 978-0-8412-3154-2 (hardcover OP) -- ISBN 978-0-8412-3153-5 (ebook) ISBN 978-1-7138-8923-6 (pod)

1. Nuclear magnetic resonance spectroscopy. 2. Chemistry, Physical and theoretical-Study and teaching. I. Soulsby, David, 1974- editor of compilation. II. Anna, Laura J., editor of compilation. III. Wallner, Anton S., editor of compilation.

QD96.N8N588 2013 543'.66--dc23

2013003382

The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48n1984.

Copyright © 2016 American Chemical Society

Distributed in print by Oxford University Press

All Rights Reserved. Reprographic copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Act is allowed for internal use only, provided that a per-chapter fee of \$40.25 plus \$0.75 per page is paid to the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, USA. Republication or reproduction for sale of pages in this book is permitted only under license from ACS. Direct these and other permission requests to ACS Copyright Office, Publications Division, 1155 16th Street, N.W., Washington, DC 20036.

The citation of trade names and/or names of manufacturers in this publication is not to be construed as an endorsement or as approval by ACS of the commercial products or services referenced herein; nor should the mere reference herein to any drawing, specification, chemical process, or other data be regarded as a license or as a conveyance of any right or permission to the holder, reader, or any other person or corporation, to manufacture, reproduce, use, or sell any patented invention or copyrighted work that may in any way be related thereto. Registered names, trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by law.

PRINTED IN THE UNITED STATES OF AMERICA

Contents

Pre	Prefaceix	
	Upper-Level Courses	
1.	¹³ C NMR Spectroscopy in Teaching Structure and Stereochemistry of Compounds in Introductory and Advanced Organic Chemistry Courses	
2.	Thematic Use of Ribavirin To Illustrate NMR Principles and Techniques 17 Brant L. Kedrowski and William F. Wacholtz	
3.	NMR-Based Activity Assays To Characterize Enzymes in the Biochemistry Laboratory and in Undergraduate Research	
4.	Utilization of Compounds from Undergraduate Research To Exemplify Concepts in NMR Spectroscopy	
5.	Investigations of NMR Chemical Shifts Using DFT-B3LYP-GIAO Calculations	
	Across the Curriculum	
6.	NMR Across the Curriculum: The Use of NMR in Chemistry Courses at a Mid-Sized Primarily Undergraduate University	
7.	NMR at the University of St. Thomas (TX): Cooperation and Collaboration with Rice University	
8.	NMR Spectroscopy: A Critical Piece of the Spectroscopy-Centered Synthetic Curriculum	

9.	A New "Spin" on Integrating NMR Spectroscopy into a Chemistry	
	Curriculum	145
	Kate J. Graham, Edward J. McIntee, and Chris P. Schaller	
10.	From a Non-Majors Course to Undergraduate Research: Integration of NMR Spectroscopy across the Organic Chemistry Curriculum at Ashland University	161
	Perry S. Corbin and Robert G. Bergosh	101
11.	Creating Scholarship Opportunities for Undergraduate Students through Use of High Field NMR Susan M. Schelble, Kelly M. Elkins, Ethan Tsai, Milton Wieder, and Rosemarie DePoy Walker	183
Edi	itors' Biographies	207
	Indexes	
Aut	thor Index	211
Sub	oject Index	213