

Solid State Batteries

Volume 2: Materials and Advanced Devices



Library of Congress Cataloging-in-Publication Data

Names: Gupta, Ram K., editor.

Title: Solid state batteries / Ram K. Gupta, editor, Pittsburg State University, Pittsburg, Kansas, United States.

Other titles: Solid state batteries (American Chemical Society)

Description: Washington, DC : American Chemical Society, 2022- | Series: ACS symposium series ; 1414- | volume 2. Materials and advanced devices | Includes bibliographical references and index.

Identifiers: LCCN 2022024895 (print) | LCCN 2022024896 (ebook) | ISBN 9780841297661 (hardcover OP) | ISBN 9780841297654 (ebook other) | ISBN 9781713886907 (pod)

Subjects: LCSH: Solid state batteries.

Classification: LCC TK2942 .S55 2022 (print) | LCC TK2942 (ebook) | DDC 621.31/242--dc23/eng/20221017

LC record available at <https://lccn.loc.gov/2022024895>

LC ebook record available at <https://lccn.loc.gov/2022024896>

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 © 2022 American Chemical Society

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

Preface	ix
1. Carbon-Based Electrodes	1
Chu Liang, Chengfu Zeng, and Sheng Liang	
2. Novel Nitride-Based Electrodes for Solid-State Batteries.....	15
Jianwen Liu, Fei Zhou, Shiquan Wang, and Rong Zeng	
3. Phosphite-Based Electrodes.....	39
Dipika Meghnani, Shishir Kumar Singh, Nitin Srivastava, and Rajendra Kumar Singh	
4. Chalcogenides as Anode Material for All-Solid-State Li-Ion Batteries.....	57
Pooja Kumari, Shivani Agarwal, Manoj Kumar, and Ankur Jain	
5. Application of Metal Hydrides for All-Solid-State Li-Ion Batteries	87
Fernando Cano-Banda, Abel Hernandez-Guerrero, Takayuki Ichikawa, and Ankur Jain	
6. Implications of Local Cathode Structure in Solid-State Batteries	113
Marm Dixit, Ruhul Amin, Anand Parejiya, Nitin Muralidharan, Rachid Essehli, and Ilias Belharouak	
7. Architectural Design of Anode Materials.....	133
Shizhao Xiong	
8. Potassium-Ion Based Solid-State Batteries	153
Puskar Chapagain and Suman Neupane	
9. Solid-State Microbatteries	181
Jun Pu and Guo Hong	
10. Solid-State Nanobatteries.....	201
Albina Jetybayeva, Berik Uzakbaiuly, Aliya Mukanova, Arailym Nurpeissova, and Zhumabay Bakenov	
11. Solid-State Lithium-Air Batteries	249
Daisuke Mori, Tao Zhang, Sou Taminato, Yasuo Takeda, Osamu Yamamoto, and Nobuyuki Imanishi	
12. Lithium-Sulfur Solid-State Batteries.....	267
Bowen Shao, Yonglin Huang, and Fudong Han	
13. Architectural Design for Flexible Solid-State Batteries.....	289
Gaind P. Pandey, James Emery Brown, and Jun Li	

14. Printable and Flexible Solid-State Batteries.....	311
Jonghyun Choi, Tenzin Ingsel, and Ram K. Gupta	
15. Three-Dimensional Printing for Solid-State Batteries	331
Rafael S. Pinto, Renato Gonçalves, Senentxu Lanceros-Méndez, and Carlos M. Costa	
Editor's Biography	351

Indexes

Author Index.....	355
Subject Index.....	357