

Solid State Batteries

Volume 1: Emerging Materials and Applications



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 ; 1413- | volume 1. Emerging materials and applications | Includes bibliographical references and index.

Identifiers: LCCN 2022024895 (print) | LCCN 2022024896 (ebook) | ISBN 9780841297685 (hardcover OP) | ISBN 9780841297678 (ebook other) | ISBN 9781713886891 (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. Solid-State Batteries: An Introduction	1
Yonglin Huang, Bowen Shao, and Fudong Han	
2. Solid-State Rechargeable Lithium-Ion Batteries: Component Chemistries and Battery Architectures.....	21
Tenzin Ingsel and Ram K. Gupta	
3. Methods and Techniques of Solid-State Batteries	39
Siddharth Sradhasagar, Soobhankar Pati, and Amritendu Roy	
4. Mathematical Modeling for Enhanced Properties	91
Shunli Wang and Wenhua Xu	
5. Mathematical Modeling of Aging Mechanisms in Lithium-Ion Batteries.....	111
M. S. S. Malik and Mubashir Gulzar	
6. Polymer-Based Solid-State Batteries	135
Mingyang Xin, Yanan Li, Lina Cong, Siru Chen, Ximeng Zhang, Haiming Xie, and Yulong Liu	
7. Recent Developments in Polymeric Composites for Solid-State Batteries	167
Gabrielle Foran, David Lepage, Steeve Rousselot, and Mickaël Dollé	
8. Polymer-Based Solid-State Electrolytes	201
Muhammad Irfan, Zeheng Yang, Jianhui Su, and Weixin Zhang	
9. Anionic Polyelectrolytes for Batteries.....	233
Gongyue Huang and Haijin Zhu	
10. Cationic Solid-State Electrolytes	255
Zhengkun Xie, Jiajia Wang, Xiyan Yue, Abuliti Abudula, and Guoqing Guan	
11. Sodium-Ion Solid-State Electrolyte.....	275
Yuyu Li and Ming Xie	
12. Ceramic-Based Solid-State Electrolytes	295
Jianhang Wang, Huiling Zhao, and Ying Bai	
13. Sulfide-Based Solid-State Electrolytes.....	319
N. C. Rosero-Navarro, M. Calpa, A. Miura, and K. Tadanaga	
14. Hydroborate-Based Solid Electrolytes for All-Solid-State Batteries.....	353
Ryo Asakura, Arndt Remhof, and Corsin Battaglia	

15. Solid Composite Electrolytes for Solid-State Alkali Metal Batteries.....	395
Yang Li, Xiaolin Guo, and Hui Wang	
16. Designing Solid-State Composite Electrolytes.....	425
Chenglin Yan	
Editor's Biography	441

Indexes

Author Index.....	445
Subject Index.....	447