

# **Copper-Based Nanomaterials in Organic Transformations**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571

Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

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. | ISBN 9781713898795 (pod)

Copyright © 2024 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

|                                                                                                                                                                                                                                         |            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Preface</b> .....                                                                                                                                                                                                                    | <b>ix</b>  |
| <b>1. Properties, Synthesis, and Characterization of Cu-Based Nanomaterials</b> .....                                                                                                                                                   | <b>1</b>   |
| Vandana Molahalli, Aman Sharma, Kiran Bijapur, Gowri Soman, Apoorva Shetty, B. Sirichandana, B. G. Maya Patel, Nattaporn Chattham, and Gurumurthy Hegde                                                                                 |            |
| <b>2. Copper-Based Nanomaterials in Coupling Reactions</b> .....                                                                                                                                                                        | <b>35</b>  |
| Vikash Kumar and Parthasarathy Gandeepan                                                                                                                                                                                                |            |
| <b>3. Copper-Based Nanomaterials in Reduction Reactions</b> .....                                                                                                                                                                       | <b>81</b>  |
| Jiasheng Wang and Ming Bao                                                                                                                                                                                                              |            |
| <b>4. Copper-Based Nanomaterials in Multicomponent One-Pot Reactions</b> .....                                                                                                                                                          | <b>109</b> |
| Sheng Zhang, Ya Gao, Yan Cao, and Ming Bao                                                                                                                                                                                              |            |
| <b>5. Copper-Based Nanomaterials in C-H Bond Activation Reactions</b> .....                                                                                                                                                             | <b>139</b> |
| Sougata Santra, Igor A. Khalymbadzha, and Grigory V. Zyryanov                                                                                                                                                                           |            |
| <b>6. Copper-Based Nanomaterials in Electrocatalysis</b> .....                                                                                                                                                                          | <b>153</b> |
| Fan Yang, Siyuan Sun, Jiahui Liu, Meitong Zhao, and Junlin Zheng                                                                                                                                                                        |            |
| <b>7. Copper-Based Nanomaterials in Gas Phase Catalysis</b> .....                                                                                                                                                                       | <b>183</b> |
| Simindokht Zarei-Shokat and Ali Maleki                                                                                                                                                                                                  |            |
| <b>8. Copper-Based Nanomaterials in the Synthesis of Heterocycles</b> .....                                                                                                                                                             | <b>193</b> |
| Ainka T. Brown, Shaunte J. Cotterell, Marcel R. Denny, and Nadale K. Downer-Riley                                                                                                                                                       |            |
| <b>9. Nano Copper-Catalyzed Coupling Reactions</b> .....                                                                                                                                                                                | <b>231</b> |
| Madhusudan Mondal, Sumit Ghosh, and Alakananda Hajra                                                                                                                                                                                    |            |
| <b>10. Utilization of Copper Nanocatalysts for Current Organic Reactions</b> .....                                                                                                                                                      | <b>257</b> |
| Nurettin Menges                                                                                                                                                                                                                         |            |
| <b>11. Green Synthesis and Application of Copper-Based Nanomaterials</b> .....                                                                                                                                                          | <b>287</b> |
| Vandana Molahalli, Sudeshna Mondal, Nithya Sri G, Renie Sebastina, Nattaporn Chattham, and Gurumurthy Hegde                                                                                                                             |            |
| <b>12. Copper-Based Nanomaterials for Biologically Relevant Compounds</b> .....                                                                                                                                                         | <b>305</b> |
| Jorge Gabriel dos Santos Batista, Murilo Álison Vigilato Rodrigues, Lucas Freitas de Freitas, Ana Carolina Moreira Fonseca, Adriana de Souza Rodrigues, Cássia Priscila Cunha da Cruz, Velaphi Clement Thipe, and Ademar Benévolo Lugão |            |
| <b>Editors' Biographies</b> .....                                                                                                                                                                                                       | <b>339</b> |

**Indexes**

**Author Index..... 343**  
**Subject Index ..... 345**