JOIN OUR MAILING LIST **NEWS & EVENTS CATALOG & TITLE LISTS** LOG IN

Publishing quality books in STEM and other fields

About Us | Conference Schedule | AAP Research Notes | Home Ordering Info Publish With Us Contact Us



Agriculture & Allied Sciences

Allied Health

Alternative & Complementary

Animal Studies & Veterinary

Anthropology

Archaeology

Bioinformatics

Biology

Biomedical

Engineering/Nanotechnology

Biotechnology

Business Management

Chemical Engineering

Chemistry

Chemoinformatics

Computer Science & Information Management

COVID and Pandemic Issues

Economics & Finance

Education

Electronics and Communications Technology

Energy Science

Engineering

Environmental Health

Environmental Science/Climate Change & Mitigation

Fisheries Science & Marine Biology

Food Chemistry & Science

Hospitality & Tourism

Library & Information Science

Materials Science

Mathematics

Mechanical Engineering

Media & Communications

Medicine & Health Sciences

Nanomedicine

Nanotechnology

Nutrition, Dietetics & Health

Chemical Engineering

Corrosion Science Theoretical and Practical **Applications**

Editors: Savas Kaya Ime Bassey Obot Demet Özkir Goncagül Serdaroglu Ambrish Singh

Ordering Info/Buy Book



In Production Pub Date: Forthcoming September 2022

Hardback Price: \$249.95 US | £193.00

Hard ISBN: 9781771886024 Pages: est 633pp with index Binding Type: Hardback /

ebook

Notes: 220 b/w illustrations

Corrosion studies have attracted considerable interest in the areas of materials chemistry and industrial chemistry, as it affects the direct and indirect costs of industry, leading to huge economic setbacks due to the need for repair, maintenance, and even shutdowns due corrosion damage. This new volume is a comprehensive resource that presents new and up-to-date, theoretical, and experimental corrosion inhibition studies.

Corrosion Science: Theoretical and Practical Applications provides an introduction and overview of corrosion science and presents theoretical and experimental studies to mitigate damage from corrosion. Taking an interdisciplinary perspective, this volume is a rich resource of studies and experiments toward solutions that are cost-effective, environmentally friendly, and low in maintenance.

The chapters cover an array of topics on the study of corrosion science, exploring different types of materials and various methods of corrosion inhibition. Topics include the use of oil and plant extracts, the application of density functional theory to study anticorrosiove effects, the use of infrared spectroscopy, the introduction of new hybrid sol-gel coatings, an atomistic simulation method, a dynamic electrochemical impedance spectroscopy (DEIS) technique, and much more.

This book offers important information on the mechanisms of corrosion science in theory and practice as well as a wealth of corrosion prevention and protection methods.

CONTENTS:

Preface

A General Introduction to Corrosion from Past to Present Goncagül Serdaroglu and Savas Kaya

1. Corrosion Inhibitors for the Preservation of Carbon Steel in Hydrochloric Acid Medium

H. Zarrok, A. Zarrouk, F. Bentiss, B. Hammouti, and H. Oudda

2. Corrosion Inhibition of Metallic Material Using Recently Developed Inhibitors and Epoxy-Based Coating Materials Sourav Kr. Saha, Manilal Murmu, and Priyabrata Banerjee

3. Recent Progress and Comprehension of Corrosion of Steels in the Hot Dip Galvanizing Industry

Younes El Kacimi, Rachid Touir, Khaoula Alaoui, and Mohamed Ebn Touhami

4. On the Application of Density Functional Theory to Study the Anticorrosiove Effects of Some Pyrazole Derivatives Zaki S. Safi, Mohammed H. Rida, and Hassan M. Tamous

5. Corrosion Inhibition of Mild Steel in Acidic Media by Synthesized Schiff **Base Derivatives** Demet Ozkii

Limitations in Corrosion Inhibition Research

6. Density Functional Theory (DFT): Practical Application and Their Ime Bassey Obot, Onyeachu B. Ikenna, and Savas Kaya





Follow us for the latest from Apple Academic Press:











AAP Editor & Author Dr. Wasim Siddigui to Lead the World Food Preservation Center, USA AAP congratulates Professor Mohammed Wasim Siddiqui on this new and prestigious appointment. In this role, he directs the planning, development, and implementation of plans within the organization, which is dedicated to reduction of postharvest food loss and wastage. Dr. Siddiqui will also originate and promote existing initiatives of the sister universities and institutes of the World Food Preservation Center® LLC. Dr. Siddiqui is editor of two book series with AAP. For more information, visit: Click here

Announcing a new AAP book series: Perspectives and Anthropology in Tourism and Hospitality (PATH) For more information, visit: Click here

The new AAP book series Innovations in Microbiology welcomes book proposals. For more information, see: Click here

AAP Seeks Book Proposals in the Humanities and Social Sciences

AAP is looking to expand our line of publications in the humanities and social sciences. If you or your colleague are interested in proposing a new book to us, please contact sandy@appleacademicpress.com for details. We are particularly interested in books on topics in these areas: criminal justice studies, current issues, gender and women's studies, international relations, multicultural and

Pharmaceutical Science & Technology

Physics

Plant Science & Botany

Polymer Science

Psychology, Psychiatry & Mental Health

Security & Disaster Management

Social Work & Social Welfare

Soil & Water Conservation

Urban Planning

Viticulture & Enology

Waste Management

Water Management

Women & Gender Studies

21st Century Business Management

AAP Advances in Artificial Intelligence and Robotics

AAP Advances in Nutraceuticals

AAP Focus on Medicinal Plants

AAP Research Notes on Chemical Engineering

AAP Research Notes on Chemistry

AAP Research Notes on Nanoscience and Nanotechnology

AAP Research Notes on Operations and Supply Chain Management

AAP Research Notes on Optimization and Decision Making Theories

AAP Research Notes on Polymer Engineering Science and Technology

AAP Series on Digital Signal Processing, Computer Vision and Image Processing

Advances in Hospitality and

Advances in Materials Science

Advances in Nanoscience and Nanotechnology

Applied Chemistry and Chemical Engineering

Biodiversity Hotspots of the World

Biology and Ecology of Marine Life

Biomedical Engineering: Techniques and Applications Book Series

Current Advances in Biodiversity, Conservation and Environmental Sciences

Electronic Commerce
Management for Business

Frontiers of Mechanical and Industrial Engineering

Innovation Management and Computing

Innovations and Challenges in Micro Irrigation

Innovations in Agricultural and

7. Corrosion Resistive Hybrid Sol-Gel Coatings Loaded with Corrosion Inhibitors
Rami Suleiman

8. Experimental Techniques in Corrosion Studies Murat Farsak and Gülfeza Kardas

9. Infrared Spectroscopy in Corrosion Research K. Haruna, I. B. Obot, and T. A. Saleh

10. Plant Extracts as Corrosion Inhibitors Xingwen Zheng and Lei Guo

11. Quantum Chemical Calculations on the Corrosion Inhibition Performance of Some Tetrazole Derivatives

Mahmooud Ibrahim A. Elusta, Murat Saracoglu, M. Izzettin Yilmazer, and Fatma Kandemirli

12. The Application of Atomistic Simulation Method in Understanding Inhibition Mechanism of Metal Corrosion

Ime Bassey Obot, Onyeachu B. Ikenna, and Savas Kaya

13. The Use of Electrochemical Quartz Microbalance Technique for Corrosion Research

Ime Bassey Obot and Onyeachu B. Ikenna

14. X-Ray Photoelectron Spectroscopy (XPS) and Its Application for Corrosion Research

Ime Bassey Obot, Onyeachu B. Ikenna, and Nuha Wazzan

15. Eco-Friendly Inhibition Corrosion of Steel in Acidic Solution Using the Oils and Plants Extracts

Mihammed Belkhaouda, Rachid Salghi, Ali Anejjar, Hassan Lgaz, and Belkheir Hammouti

16. Study of Corrosion, Scale Processes, and Development of Microorganism and Their Inhibition in Moroccan Simulated Cooling Water Rachid Touir, L. Elhousni, and Mohamed Ebn Touhami

17. Green Corrosion Inhibitors: Natural Polymers and Amino Acids Saviour A. Umoren and Moses M. Solomon

18. The Application of Dynamic Electrochemical Impedance Spectroscopy (DEIS) Technique in Corrosion and Corrosion Inhibition Studies Pawel Slepski, Husnu Gerengi, Moses M. Solomon, and Saviour A. Umoren

Index

ABOUT THE AUTHORS / EDITORS:

Editors: Savas Kaya

Associate Professor of Inorganic Chemistry, Sivas Cumhuriyet University, Health Services Vocational School, Department of Pharmacy, Sivas, Turkey

Savas Kaya is Associate Professor of Inorganic Chemistry at Sivas Cumhuriyet University, Health Services Vocational School, Department of Pharmacy, Sivas, Turkey. He earned a doctorate degree in 2017 in the field of theoretical inorganic chemistry. His research is concerned with theoretical chemistry, computational chemistry, materials science, corrosion science, physical inorganic chemistry, and coordination chemistry. Savas Kaya has published more than 140 papers in international journals indexed SCI and SCI; his h-index is 26. He is the editor of the books Conceptual Density Functional Theory and Its Applications in the Chemical Domain and Corrosion Science: Theoretical and Practical Applications. He is the author of 10 book chapters. Recently, he introduced the Kaya chemical reactivity approach and the Kaya combined reactivity descriptor and proposed many electronic structure principles.

Ime Bassey Obot

Associate Professor, Interdisciplinary Research Center for Advanced Materials (IRC-AM), King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia

Ime Bassey Obot, PhD, is an Associate Professor at the Interdisciplinary Research Center for Advanced Materials (IRC-AM) at King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia. Dr. Obot has authored/co-authored over 200 research articles in international peer-reviewed journals of wide readership as well as critical reviews and book chapters. He is a recipient of three US patents and several invention disclosures. He is on the editorial board of twelve international journals and a reviewer to nearly 100 international ISI journals. Since joining KFUPM, he has won Distinguished A+ in Research consecutively from 2013-2020. He was recently honored by the Rector of KFUPM for his outstanding research. He also teaches corrosion science and engineering course to chemical engineering students at KFUPM. Dr. Obot is a member of many international societies including the National Association of Corrosion Engineers, Italian Corrosion Society (ICS), European Desalination Society, and American Chemical Society. He obtained a BSc in Applied Chemistry at the University of Uyo, Nigeria in 2003, MSc (Physical Chemistry) and PhD (Physical Chemistry-Corrosion Electrochemistry) from the University of Ibadan, Nigeria in 2006 and 2012, respectively.

Demet Özki

Associate Professor at Nigde Ömer Halisdemir University, Faculty of Arts & Sciences, Department of Chemistry, Nigde, Turkey

regional studies, politics and government, and social science, to name a few. Please feel free to share this with your colleagues. AAP titles are co-published with CRC Press/Taylor & Francis.

COMMENTS FROM AAP EDITORS AND AUTHORS

AAP book title: Advances in Audiology and Hearing Science (2-volume set)

volume set)

"I have collaborated with AAP
during the process of bringing my
two-volume editing work "
Advances in Audiology and Hearing
Science" to a final publishing
phase. Despite the fact that the
book brought together 41 different
authors (with very different
writing styles), AAP support has
been truly important throughout
the initial and final stages of the
book. While the majority of the
publishing work is done at the
early stages, the final touches that
include the last-minute corrections
of the authors are extremely
crucial to the quality the book
tries to convey. The assistance of
AAP during the last stages of
corrections and communication
with the authors was a very
positive contributor to my state of
mind during those stressful
moments. I recommend the
publishing experience with AAP to
other editors of scientific
material." —Stavros Hatzopoulos,
PhD, Hearing Science Laboratory,
University Hospital of Ferrara,
Ferrara, Italy

AAP book title: Nanotechnologies: The Physics of Nanomaterials (2-

"As the author of a two-volume book on nanotechnologies, I was very pleased with the interaction and support of the team at Apple Academic Press. They provided me with regular and useful information and updates throughout the publishing procedure. I am also very happy with the final product, which is of good quality. The books are now available and are professionally distributed through the various channels. I would like again to thank the team at AAP for all their hard work and support." —David Schmool, PhD, Director, Groupe d'Etude de la Matière Condensée GEMaC, National Centre for Scientific Research, Université de Versailles/Saint-Quentin, Université Paris-Saclay, Versailles, France

AAP book title plus many others: Physiology of Molluscs (2-volume

"Since my first recent association, I have enjoyed the full benefit of support, encouragement, and kindness from the members of AAP I have had the pleasure of being associated with. In the same vein, I hope AAP was satisfied with the book series I have edited in advancing the knowledge. It has been a great pleasure and satisfaction. Advancing scholarship through publications is one of the best routes publishers can take, and I would hold AAP as one of the best ones." —Saber Saleuddin, PhD, University Professor Emeritus, Department of Biology, York University in Toronto, Ontario, Canada

AAP book title plus many others: Green Chemistry and Sustainable Technology: Biological, Pharmaceutical, and Macromolecular Systems "It had been my pleasure to work with the production team of Apple Academic Press for almost a decade. The best presentation of our work was due to their hard work and with careful scrutiny. I am sure that every one of them takes extra pains to publish the book nicely, maintaining the quality and timeliness. It was a rewarding experience to work with AAP. I would like to publish more with AAP on my upcoming projects in future also." —Prof. Suresh C. Ameta, Professor of Eminence

Biological Engineering

Innovations in Biotechnology

Innovations in Chemical Physics and Mesoscopy

Innovations in Computational Chemistry

Innovations in Horticultural Science

Innovations in Microbiology

Innovations in Physical Chemistry: Monograph Series

Innovations in Plant Science for Better Health: From Soil to Fork

Modern Trends in Food Science

Modern Trends in Molecular Biology

Omics Biology in Life Sciences

Perspectives and Anthropology in Tourism and Hospitality (PATH)

Postharvest Biology and Technology

Research Advances in Sustainable Micro Irrigation

Research Notes on Computing and Communication Sciences

Demet Özkir, PhD, is currently Associate Professor at Nigde Ömer Halisdemir University, Faculty of Arts & Sciences, Chemistry Department, Nigde, Turkey, since 2019. She was a research assistant at Nigde University from 2004 to 2012 and also an assistant professor (2012-2019) at the same university. She is a member of the Corrosion Association of Turkey. Her research interests are corrosion and green inhibitors and synthesizing application-oriented organic corrosion inhibitors. She received her BSc in 2002 from the Chemistry Department of Faculty of Arts and Sciences, Selçuk University, Turkey, and her MSc in 2005 from the same university. She obtained her PhD in 2012 in physical chemistry from the Ni?de University.

Goncagül Serdaroglu

Assistant Professor, Sivas Cumhuriyet University (Mathematics and Science Education Department), Turkey

Goncagül Serdaroglu works at Sivas Cumhuriyet University (Mathematics and Science Education Department), Turkey, as Assistant Professor. Her primary research fields are chemical reactivity behavior of the pharmaceutically important molecules by using computational tools. Recently, she has focused on the spectroscopic (IR, NMR, UV) and NLO (nonlinear optic) properties of the molecular systems. She has published 30 research papers in the journals related to computational theoretical chemistry, including the International Journal of Molecular Liquids, Journal of Molecular Structure, Journal of Quantum Chemistry, etc. She earned her PhD degree from Sivas Cumhuriyet University (Theoretical Chemistry) and was a postdoctoral fellow with Prof. Joseph Vincent Ortiz in the Chemistry and Biochemistry Department, Auburn University, Alabama, USA.

Ambrish Singh

Professor, School of New Energy and Materials, Southwest Petroleum University, China

Ambrish Singh, PhD, is Professor in the School of New Energy and Materials, Southwest Petroleum University, China. He is leading the Corrosion Research Group with master's students and PhD students and postdoctoral researchers. His research interests are mainly focused on corrosion, electrochemistry, green chemistry, quantum chemistry, smart coatings, polymers, nanomaterials, composites, and petroleum engineering. Before moving to China, Dr. Singh worked as Assistant Professor in the Department of Chemistry at Lovely Professional University, Phagwara, Punjab, India. He has published more than 120 SCI peer-reviewed research papers in high-impact journals. He is acting as a reviewer for more than 40 high-impact journals and as editor for several journals. He is included as a board member for several journals and has been invited to present his work at several national and international conferences, seminars, and workshops. He received the prestigious Sichuan 1000 Talent Award from the Sichuan government, China, for his outstanding research contributions as a faculty. He also received the President's Award for exceptional postdoctoral research work and the Young Scientist Award from the Council of Science and Technology, Lucknow, India. He received a best oral presentation award in Sanya, China, during a Global Conference on Materials Science and Engineering. He has drafted five patents and granted one patent based on his new and innovative findings in China. He has finished several state and provincial projects in China and India. He is also serving as a consultant for a project on corrosion inhibitor for CO2 environment from Saudi Arabia. He is a member of the National Association for Corrosion Engineers, Society of Petroleum Engineers, and American Chemical Society.

(Distinguished Professor), Faculty of Science, PAHER University, UDAIPUR, India

AAP book title: New Frontiers in

Nanochemistry, 3-volume set, plus many others "Publishing a book, either as author or editor, is a journey from the initial vibration to the piece of knowledge towards the present future of humanity at large. Such a journey is about climbing and tunneling, about diving and driving through, about inspiration and tuning, about hard working in every instance; and it is also about time. Very few Global Publishers have the wisdom and patience and kindness and openness to authors, contributors, and readers while being truly crafting oriented as Apple Academic; yet all is about people and their education, vision and assumed mission; the Apple Academic Team heartily succeed that in achieving the world class scholarly acclaim by the quality involvement in all chain of plus value added with each publishing event. Hearty Compliments!
Excelsior Apple Academic!" –Mihai V. Putz, PhD, Dr. -Habil., MBA, Professor, Faculty of Chemistry, Biology, Geography, Laboratory of Computational and Structural

AAP book title: The Chemical Century: Molecular Manipulation and Its Impact on the 20th Century "All my experiences with AAP have been very positive. I entrusted AAP with the publication of The Chemical Century: Molecular Manipulation and Its Impact on the 20th Century and found the quality of the book that they produced to be excellent. My two contacts at the company were very responsive and efficient throughout the publication process." —Richard J. Sundberg, PhD, Professor of Chemistry, University of Virginia, Charlottesville, Virginia, USA

Computational and Structural Physical Chemistry for Nanosciences and QSAR, West University of Timi? oara; PI-1, Laboratory of Renewable Energies - Photovoltaics, National Research and Development Institute

for Electrochemistry and Condensed Matter (INCEM), Timi?oara, Romania

AAP book titles: Medical Tourism and Wellness: Hospitality Bridging Healthcare (H2H)© and Medical Travel Brand Management: Success Strategies for Hospitality Bridging Healthcare (H2H)
"I have enjoyed my scholarly creative work with Apple Academic Press. They have been timely, creative, and very helpful for my two books with them. I encourage you to consider publishing your work with AAP."—Frederick DeMicco, PhD, RDN, Executive Director and Professor School of Hotel and Restaurant Management, Northern Arizona University, Flagstaff, Arizona

AAP book title: Coping with Biological Growth on Stone Heritage Objects: Methods, Products, Applications, and Perspectives "It was a wonderful day when, some years ago, AAP accepted to publish the book on which I've been working for years. My experience was very good and confirms that AAP is a publisher of quality and looks for quality books. Everyone on the AAP team gave me the utmost care for which I will always be grateful. They took the time to discuss my proposal. This meant transforming some aspects and changing the proposal, but it made for a stronger and better book. I really appreciated the team members for outstanding performance and the skills they used to achieve that performance. I am very thankful for their help and effort, for their professional guidance and assistance." —Daniela Pinna, Department of Chemistry, University of Bologna, Italy

AAP book title: The Chemical Evolution of Phosphorus: An Interdisciplinary Approach to Astrobiology "I'm very pleased with the books

you have edited. It shows a very good and careful work by everyone involved along the whole production process, and so the final result is a beautiful piece: it has come out as a very nice and appealing book, easy to handle and read, and hopefully of interest for people from diverse related fields!"—Enrique Macia-Barber, PhD, Professor of Condensed Matter Physics, Universidad Complutense de Madrid, Spain

AAP book title: Phytochemistry, 3-Volume Set "As the Principal Editor for the trending 3-volume set book of Phytochemistry, I wish to express my sincere gratitude to the management of AAP for their excellent publishing services. Our publishing experience is positive, and the outcome of the book is one that is attracting lots of interests and recommendations from eminent scientists and research scholars worldwide. Our students, who are privileged to be the first users of the book, are very happy with the simplicity of the chapters. I also wish to express my happiness about the robust distribution channel of APP and, more especially, the print quality of our book. I look forward to working with AAP again." — Chukwuebuka Egbuna (MNSBMB, MICCON, AMRSC), Department of Biochemistry, Chukwuemeka Odumegwu Ojukwu University, Uli-Campus, Anambra State, Nigeria

AAP book title: Sustainable Viticulture: The Vines and Wines of Burgundy
"I would like to thank Dr. Mahmood Khan and AAP warmly for offering me the opportunity to publish my book Sustainable Viticulture: The Vines and Wines of Burgundy. I found a lot of pleasure in reflecting on my experience and observations as a viticulturist in Burgundy and other regions of the world. I enjoyed putting in writing thoughts, memories, and ideas I've had for years. I also found pleasure in synthesizing discussions I've had with wine professionals and wine buffs as well as reading notes I regularly jotted down. I can also add that I very much appreciated the friendly and firm support and guidance of the staff of Apple Academic Press." —Claude Chapuis, Associated Preference Cheep of Wines.

AAP book title: Polymeric
Thermosetting Compounds:
Innovative Aspects of Their
Formulation Technology
"I was recently thrilled to flip the
pages of my new book, Polymeric
Thermosetting Polymers. This book
shares a lifetime of lessons from
my pioneering efforts in compound
custom formulating. That is why I
am so very grateful to AAP for
making it possible to get this
unique book into worldwide
circulation. The expert team at
AAP made the experience of
writing, organizing, and polishing
the book quite enjoyable." —Ralph
D. Hermansen, Formerly Senior
Scientist, Hughes Aircraft Company,
El Segundo, California

Associate Professor, School of Wine & Spirits Business, Dijon, France

AAP book title: Organizational Behavior and Virtual Work: Concepts and Analytical Approaches
"Glad to see the final outcome of the book. It was truly wonderful & smooth experience to work with AAP. Definitely, looking forward to more exciting and fruitful association in future." —Arvind K. Birdie, PhD, Associate Professor and Acting Principal, IIMT School of Management (Oxford Brooks University), Gurgaon, India

AAP book title: Research for the Radiation Therapist: From Question to Culture
"Working with Apple Academic Press was a rewarding and collaborative experience. Effort was made to truly understand what we hoped to accomplish in publishing our work, and the team was responsive and receptive to

our queries, feedback, and revisions. The high quality of the final product and its success is a reflection on the quality of the partnership we experienced with AAP in realizing this project." — Caitlin Gillan, Asst Professor, libriusrity of Torenty Capada. University of Toronto, Canada

AAP book title: Industrial Catalysis and Separations: Innovations for

and Separations: Innovations for Process Intensification
"I have published more than two hundred and thirty articles and thirteen book chapters and monographs in my life. Publishing with Apple Academic Press has been by far my very best experience. AAP is extremely cordial at every state of book processing, highly professional in maintaining the quality and meeting the deadlines. I wholeheartedly recommend wholeheartedly recommend anyone to consider publishing with AAP." – Benjaram M. Reddy, Chief Scientist & Head, CSIR - Indian Institute of Chemical Technology, Hyderabad, India

AAP book titles: Facilitating Deep Learning: Pathways to Success for University and College Teachers and Teaching Law and Criminal Justice Through Popular Culture: A Deep Learning Approach in the Streaming

Learning Approach in the Streaming Era
"Working with Apple Academic Press is a great experience, as I felt supported from the conception of the book to its completion. My latest book originated from an email that I received from Ashish Kumar who suggested that I write a new book on teaching and learning. new book on teaching and learning after AAP had published my previous book. From that day previous book. From that day onwards, it has been a real pleasure to go through each stage of the publishing process with AAP. Everyone works hard, very professionally, and, above all, very enthusiastically. The editors pay attention to details that no one attention to details that no one else can detect. And they suggest alternatives in a very proactive way. Sandy Sickels is incredibly helpful and supportive. I am very grateful to everyone at AAP and am looking forward to publishing another book with them." —Julian Hermida, PhD, Associate Professor, Department of Law and Politics, Teaching and Learning Committee, Algoma University, Sault Ste. Marie, Ontario, Canada

Ordering Info Publish With Us Contact Us Home About Us Conference Schedule Mailing List News & Events Downloads

Copyright © 2023 Apple Academic Press Inc. All Rights Reserved.