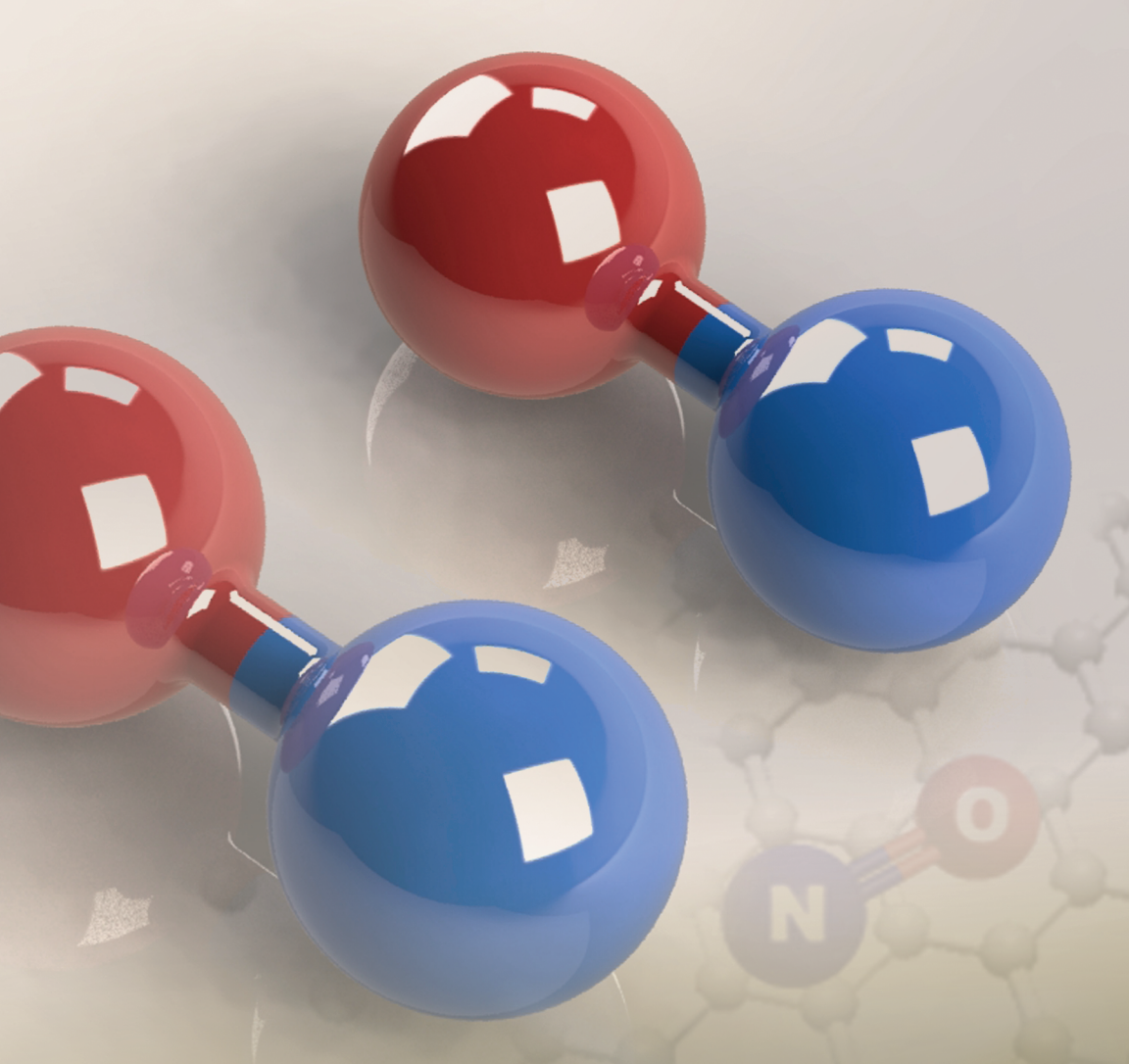

Nitric Oxide Sensing

Sagarika Bhattacharya
Subhra Samanta
Biswarup Chakraborty

Nitric Oxide Sensing

Nitric Oxide Sensing

Sagarika Bhattacharya
Subhra Samanta
Biswarup Chakraborty

JENNY STANFORD
PUBLISHING

Published by

Jenny Stanford Publishing Pte. Ltd.
Level 34, Centennial Tower
3 Temasek Avenue
Singapore 039190

Email: editorial@jennystanford.com
Web: www.jennystanford.com

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library.

Nitric Oxide Sensing

ISBN 978-981-4877-67-1 (Hardcover)
ISBN 978-1-003-14218-8 (eBook)

Contents

Preface

Nitric oxide, an important bio-interesting signaling molecule in living organisms, is associated with cardiovascular, neuronal, and immunological cell regulatory functions. Beside these, it plays a major role in vasodilation and signal transduction. The irregular NO homeostasis causes several diseases like hypertension, cardiovascular diseases, stroke, neuro-degeneration, and gastrointestinal distress. However, nitric oxide is typically biosynthesized by a group of enzymes called nitric oxide synthase (NOS) during the conversion of arginine to citrulline at the intravascular/extravascular interface having a life time of 2–6 sec at a physiological pH that depends on oxygen concentration. Consequently, the selective detection and quantification of NO concentration in bio-samples is particularly important for signaling point of view by various sensors, whether they are molecular complexes, nanomaterials, electrochemical methods, or devices. This book summarizes the recent developments in NO detection by small molecules, metal-organic probes, carbon nanomaterials, metal nanoparticles, and even modern devices developed or commercialized. The methodologies adopted for NO identification are based mainly on fluorescence quenching, electrochemical, and colorimetric detection.

This book comprises five chapters containing sensing capability of NO as gas and in aqueous solution. A brief introduction of NO, including electronic structure and its influence on the reactivity is discussed in Chapter 1. Chapter 2 describes the development of small organic molecules, transition metal complexes, and their polymer-embedded structure for NO detection. Recently developed carbon nanomaterials (especially carbon dots, nanotubes, and graphenes) for NO sensing via fluorescence quenching mechanism pathway have been discussed in Chapter 3. In addition, electrochemical recognition of NO by single- or multi-walled carbon nanotubes and functionalized graphene have also been summarized in Chapter 3. Details of electrochemical NO sensing by metal complexes [Pt(II), Ni (II)], metal(0) nanoparticles (Au, Pt, Ag), different nanocomposites, and nano-biocomposites are discussed in Chapter 4. The last chapter

is dedicated to the modern devices that have been fabricated or commercialized for practical NO detection in nasal breath samples for inflammation study in humans.

This book is an ideal guideline for researchers working in the NO-sensing area. It will also enrich the knowledge of master's students and is recommended as a reference book for universities and research institutes.

We express our sincere gratitude to Prof. Sasankasekhar Mohanta (University of Calcutta, India), Prof. Abhisek Dey (IACS Kolkata, India), Prof. Tapan Kanti Paine (IACS Kolkata, India), Prof. Ashok K. Ganguli (IIT Delhi, India), and Prof. Nicolai Lehnert (University of Michigan, USA) for their invaluable reviews for this book.

Sagarika Bhattacharya

Subhra Samanta

Biswarup Chakraborty

April 2021