

Preface

Over the past three and a half decades since the discovery of electronically conducting polymers, the large-scale potential applications have been evidenced, and many of them have been realized or available on the market. To improve the functionality of such polymer-based devices, the multifaceted cognition of these materials is indispensable. Elucidation of their redox switching between nonconducting and conducting states is of prime importance, requiring overall knowledge on the details of the complex process, triggered by an electrochemical transformation.

In situ electrochemical techniques are widely applied to study this phenomenon, because they deliver extra information about the processes from an additional aspect. Thus, color (or other spectral) modifications, mass, structural, volume, and conductivity changes—occurring in parallel with the electrochemical process—provide the complete knowledge by enlightening secondary effects of the electrochemical perturbation. The book is dedicated to the advantages of such combinations enabling to correlate various additive features, provoked by the electrochemical change as the common background. There is a fairly large number of books and book chapters available dealing with either conducting polymers or in situ electrochemical methods. However, only a few are dedicated to in situ methods applied directly to this family of redox active modified electrode layers.

The aim of this book is to link the most prominent properties of conducting polymers with the respective (combined) analytical methods which enable the in-depth understanding of such behaviors. This approach is indeed important, because it brings scientists closer to the rational design of new polymeric and hybrid materials for various applications. Moreover, recent technical developments have led to combination of two in situ analytical methods to enhance the understanding of redox behavior of conducting polymers by furnishing information on the self-same polymer film from several aspects at the same time by employing two in situ electrochemical techniques in a hyphenated mode. Despite spectacular developments in the last decade, there is no book or even a book chapter on the hyphenated in situ techniques.

Beyond the researchers involved in electrochemistry and conducting polymers, the materials science and especially materials chemistry/physics communities will also benefit from this book. Analytical chemists may also be interested; however, our primary goal is not to analyze the technical details of the presented methods, but to demonstrate their relevance to better understand conducting polymers (CPs). Importantly, this work extends further than CPs, since, to some extent, the presented methods can be implemented for various other electroactive materials as well, contributing to the work of anybody working with chemically modified electrodes.

This book is primarily aimed at an academic audience, but will also be useful for a wide range of professionals at different career stages, ranging from students to experienced researchers. As practicing educators, our aim is to provide an overview of the field. This approach makes the book useful to a wide range of people, from masters students to any scientist who wants to investigate and understand the electrochemical and coupled properties of electroactive materials.

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