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Nota di contenuto	Preface; Contents; 1. Introduction; 2. Physical Principles of Ionic Polymer-Metal Composites; 2.1 Introduction; 2.2 Manufacturing IPMC Materials; 2.3 IPMC Electrode Selection and Associated Electrode Models; 2.3.1 Palladium-buffered Pt electrodes; 2.3.1.1 Fabrication procedure; 2.3.1.2 Electrical and mechanical characteristics; 2.3.2 Electrode effect on mechanical and thermal behavior; 2.3.2.1 Results; 2.3.3 Electrode modeling; 2.3.3.1 Estimation of electrical properties; 2.3.3.2 Experiments for electrode control; 2.4 Actuation Behavior and Mechanism of IPMCs; 2.4.1 Back relaxation phenomenon 2.4.2 Electrochemical study of the IPMCs 2.4.3 Low-temperature characteristics of IPMCs; 2.5 More Complex Configurations of IPMC Actuators; 2.5.1 Equivalent modeling of IPMCs based on beam theories; 2.5.2 3D full-scale physical model of patterned IPMCs; 2.5.3 IPMCs as linear actuators; 2.5.4 IPMC-based actuators in multi-layer configurations; 3. New IPMC Materials and Mechanisms; 3.1 Multi-Field

Responsive IPMCs; 3.2 IPMCs Loaded with Multiwalled Carbon Nanotubes; 3.3 IPMCs Incorporating ZnO Thin Film; 3.4 A Self-oscillating IPMC; 3.4.1 Self-oscillating actuation of IPMC  
3.4.1.1 Electrochemical oscillations on Pt electrode  
3.4.1.2 Electrochemical self-oscillating actuation of IPMCs; 3.4.2 Modeling the oscillating actuation; 3.4.2.1 Finite-element bending model of IPMC; 3.4.2.2 Modeling self-oscillations; 3.4.2.3 Summary; 4. A Systems Perspective on Modeling of Ionic Polymer- Metal Composites; 4.1 Introduction; 4.2 A Physics-based, Control-oriented Model; 4.2.1 Dynamics-governing PDEs; 4.2.2 Impedance and actuation models; 4.2.2.1 Impedance model; 4.2.2.2 Actuation model and its reduction; 4.2.3 Experimental model validation  
5.3.2 Model scalability  
5.4 Robust Adaptive Control of Conjugated Polymer Actuators; 5.4.1 Design of robust adaptive controller; 5.4.1.1 Model reduction; 5.4.1.2 Robust self-tuning regulator; 5.4.2 Experimental results; 5.5 Redox Level-dependent Admittance Model; 5.5.1 Model development; 5.5.2 Experimental model validation; 5.6 Nonlinear Elasticity-based Modeling of Large Bending Deformation; 5.6.1 Nonlinear mechanical model; 5.6.2 Experimental model validation; 5.7 Nonlinear Mechanics-Motivated Torsional Actuator; 5.7.1 Nonlinear mechanical model; 5.7.2 Actuator fabrication  
5.7.3 Experimental results

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## Sommario/riassunto

Biomimetic Robotic Artificial Muscles presents a comprehensive up-to-date overview of several types of electroactive materials with a view of using them as biomimetic artificial muscles. The purpose of the book is to provide a focused, in-depth, yet self-contained treatment of recent advances made in several promising EAP materials. In particular, ionic polymer-metal composites, conjugated polymers, and dielectric elastomers are considered. Manufacturing, physical characterization, modeling, and control of the materials are presented. Namely, the book adopts a systems perspective to integrate

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