

# Preface

This book began as a literature review to fulfill Gobinath Pillai Rajarathnam's Ph.D. candidature requirements. Over time, as more references were added and more publications reviewed, the manuscript evolved into a detailed technical overview of short- and long-term materials and design challenges to zinc/bromine (Zn/Br) flow battery advancement. It explained the need for energy storage in the electrical grid and how major issues arising from such an endeavor might be met with the Zn/Br system. Practical interdisciplinary pathways forward were then identified via cross-comparison and comprehensive review of significant findings from a growing list of more than 300 published works spanning initial flow battery development to state-of-the-art research in related systems up until as recent as May 2015.

Promising strategies were developed on various fronts, such as the use of sophisticated electrochemical techniques to optimize physical processes occurring within the system during operation, improvement of zinc electroplating quality during the charge phase through the strategic use of organic additives, and “mapping” fundamental halogen reactions to catalytically optimize the bromine/bromide redox. It became clear that the primary focus should be on research and development of novel materials in the areas of electrolyte formulation and multifunctional “smart” electrode surfaces to achieve a higher degree of control over processes at the electrode–electrolyte interface.

The investigative pathways and strategies suggested in this book are devised to inspire and guide future innovations and progress in Zn/Br flow battery performance. They are also highly adaptable for use in other similar flow battery systems. The unique cross-comparative approach makes it a useful reference and a source of new ideas for both new and established researchers in the field of energy storage and battery technology. In the long run, one of the main goals in pursuing such

technology is facilitation and increased uptake of renewable energy technologies that have been kept at bay due to their intermittent nature. Further to that, it is hoped these efforts will in turn improve the lives of those with the greatest need.

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The Zinc/Bromine Flow Battery

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