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Autore	Wang Yun
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Polymer electrolyte membrane (PEM) fuel cells, which convert the
 chemical energy stored in hydrogen fuel directly and efficiently to
 electrical energy with water as the only by-product, have the potential
 to reduce our energy usage, pollutant emissions, and dependency on
 fossil fuels. Tremendous efforts have been made so far, particularly
 during the last couple of decades or so, on advancing the PEM fuel cell
 technology and fundamental research. In addition to the large number
 of research and review paper publications, several classic books have
 been published and are available in the market, which are primarily for
 introductory level readers. There are, however, very few books that
 address the graduate-level or advanced aspects of PEM fuel cells and
 are based on the first principles or conservation laws, dimensionless
 analysis, time constant evaluation, and numerical simulation by solving
 partial differential equations. There are abundant knowledge regarding
 flow, heat transfer, and mass transport in general engineering, which
 has been successfully extended to the water and thermal management
 of PEM fuel cells. This book contributes to this aspect of PEM fuel cell
 technology; that is, it focuses on the fundamental understanding of
 phenomena or processes involved in PEM fuel cells.
