
Book review

Matthew M. Mench: Fuel Cell Engines

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Although the science and technology of fuel cells is evolving at a rapidly accelerating rate – as the author himself points out in the first chapter of his book –, textbooks summarizing this field are still rare.

The author, the Director of the [Fuel Cell Dynamics and Diagnostics Laboratory](#) at the PSU is an active researcher of this field. The book is based mainly on course materials developed by him for graduate and undergraduate classes, but is more than a course book.

In the first chapter a very realistic assessment of the present and future uses, advantages and limitations of fuel cells is given. Fuel cells are compared to other competing technologies and a classification and basic nomenclature is provided. Different types of fuel cells are introduced together with their application fields. The second chapter goes through the fundamental electrochemical principles needed for the understanding of the general operation of fuel cells. It can be stated that the chapter really starts from the absolute basics, however since the book is intended for students of other engineering fields as well, so this is actually an advantage. The same is probably true (of course for those cultivating the respective fields of science) for the third and fifth chapter discussing thermodynamics and mass/heat transfer, however as the book proceeds the author illustrates the new phenomena with more and more real-life examples, always keeping the aim (i.e. fuel cells) over the horizon. The fourth chapter (that could be easily placed before the fifth) discusses in detail the polarization curve as the main characterization tool of the performance of fuel cells. Several theoretical and semi-empirical models for different sections of the curve are shown. In the next two chapters culminate all the theoretical preparations of the previous parts of the book. Due to the author's own research experience the operational and design issues and of polymer electrolyte fuel cells are discussed in very fine detail in a separate chapter. The seventh chapter summarizes all the other fuel cell types in a bit shorter volume than the one dedicated to the PEFC, not going into such extensive detail, however concentrating on the differences (advantages and problems alike) allows a concise overview of all the fuel cell varieties that were historically, are presently, or could be important in the future. Chapter eight discusses a closely related issue, hydrogen as the principal fuel of fuel cells, giving an insight on topics from industrial scale production to storage options and delivery possibilities. The last chapter – drawing again from the professional experience of the author – stands a bit aside from the rest of the book, introducing experimental tools used for the diagnosis of fuel cells, providing a starter for laboratory projects.

Throughout the book, the author provides the view of an engineer, not letting the reader forget that the electrochemical cell itself is only one part of a larger construction, its operation, efficiency and economy is inseparable from other subsystems (blowers, pumps, fuel storage, etc.).

At the end of each chapter an application study and a wide selection of problems and exercises makes this book an excellent textbook for university courses, giving the students the possibility to learn through their own work. The problems are always related to real life keeping the interest of the reader, most of them urging the students to seek resources on the web or elsewhere, collating information and making their own judgments.

The book is aimed mainly at engineering students (from all fields of engineering) and converts from other branches of science. The extensive and comprehensive reference list connected to the chapters and the wide material covered especially in case of PEFCs however makes the book interesting even for researchers of related topics.

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