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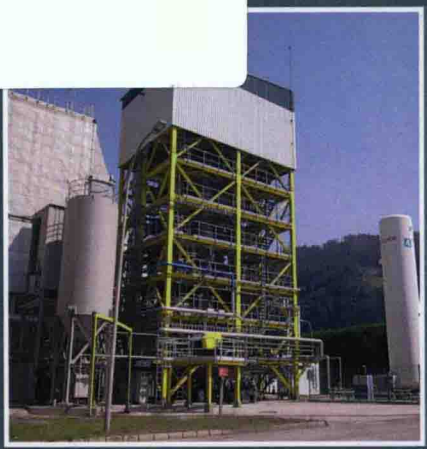

Fluidized bed technologies for near-zero emission combustion and gasification

Edited by Fabrizio Scala

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Preface

In late spring 2011, I was contacted by Woodhead Publishing to see if I was interested in editing a book on *Fluidized bed technologies for near-zero emission power generation*. This proposal got me excited but I was also a little uncertain. The first point was my unwillingness to edit a low-quality open access book (such as those that are being continuously solicited by tens of mails from obscure publishers). Regarding this aspect, the proposal by Woodhead appeared to be satisfactory, involving a well-reputed and dynamic publisher and the production of both hard-copy and electronic books to be sold worldwide. The second point was to determine the timeliness of such a project. So I made a very thorough search for books and review papers on the subject of fluidized bed (FB) combustion and gasification. The result was that most of the relevant material had been published more than a decade ago, with very few exceptions. In particular, no available book related to FB combustion/gasification contained chapters focusing on recent carbon dioxide capture technologies. This result convinced me to accept the book proposal. Thus, after slightly changing the original book title to the current one, I drafted a new book structure, that was accepted by the publisher, and then I compiled a list of the possible chapter contributors.

My principal criterion in compiling this list was the expertise and the reputation of each proposed contributor in the specific field treated by each chapter. At this point I had in my hands a sort of wish list of authors, and I was somewhat afraid of the response that they would have to my proposal, once contacted. But, contrary to my expectations, the response was overwhelmingly positive. Out of 23 chapters, invitations to write 21 of them were accepted by the first authors I contacted! The only two chapters left were readily re-assigned to other well-reputed authors, so that by the end of 2011, I had a full book project and a nice group of enthusiastic authors. In the following months my activity consisted first of reviewing the chapter plans (to avoid excessive overlap between the chapters) and then reviewing the first drafts of the chapters. I decided to review myself all the book chapters (apart from those where I was involved personally), because I wanted to maintain a similar structure and qualitative level among the chapters. I have to admit

that this was really hard work for me, also because at the same time I was writing my contributions to several of the book chapters. Fortunately, this work was helped by the very high quality of the chapter drafts and by the excellent cooperation of the staff at Woodhead, who took care of all the boring duties. After this intensive activity, my next task was definitely easier. I had to check the final drafts of the chapters, and eventually update the final order and title of the chapters. By the end of 2012, all the work was finished and the final editorial work at Woodhead could begin. The book was almost ready!

Let me spend a few words talking about the book structure. My objective was to give an up-to-date and comprehensive picture of FB combustion/gasification technology, with a focus on new emerging carbon capture technologies, and that the book should be suitable for experienced researchers and operators, as well as inexperienced students and engineers. As a consequence, it was important to include in the book both a state-of-the-art review of basic FB technology and a description of the most recent accomplishments in this field. At the same time, I tried to balance a fundamental description of the fluidization features with more application-oriented practical issues. Ultimately, the book was divided into five parts.

The first part (Chapters 1–6) presents a general overview of fluidization technology with some historical details, a description of particle characterization methods and particle behavior in a fluidized system, and an overall picture of the properties of bubbling and circulating FBs (which are by far the most common fluidization states in combustors and gasifiers). The last two chapters in this section deal in detail with some specific basic phenomena (heat/mass transfer, attrition) which assume a particular relevance in FB combustors/gasifiers.

The second part (Chapters 7–13) was structured so as to give a comprehensive description of the fundamental research focused on FB combustion and gasification. In this section the following aspects are treated: FB behaviour of solid, gaseous and liquid fuels, as well as that of sorbents; pollutant generation and capture; reactor design and scale-up criteria; modelling of FB combustors and gasifiers; and finally some economic evaluations of these FB technologies.

In contrast to the first two parts, which have a more fundamental character, the third part (Chapters 14–18) is more practically oriented. The most recent advances in atmospheric (stationary and circulating) as well as pressurized boilers for coal, biomass and waste are described here. The characteristics of the FB gasification technology are also reported in detail. For all these technologies both the current status and future perspectives are discussed. Finally, the most recent measurement techniques in FB systems are described with a focus on some industrial applications.

The fourth part (Chapters 19–22) is focused on the emerging carbon capture