PREFACE

About 10 years ago, I met with Professor Neville Boden at Leeds University when he had just inaugurated the Self Organizing Molecular Systems Centre (http://www.soms.leeds.ac.uk/). His ambition, as I understood it at the time, was to create a focused research effort on the physico-chemistry of short amino-acid sequences (peptides of less then 25 residues) and develop understanding on how molecules, through intermolecular interactions, may aggregate at various length and time scales. To an industrial researcher scouting for new materials and applications, the effort in place looked interesting but quite academic with very limited value if any to the chemical industry. However, the enthusiasm and motivation of Professor Boden and his team, together with some further detailed discussions, made me realize that in fact all materials at the macroscopic scale perform as a consequence of the very specific, often hierarchical organization potential of the composing atoms or molecules. Furthermore, the opportunity of learning from nature including the reuse of molecular building blocks looked like a way to innovate synthetic materials as to chemistry, application performance, and sustainability. Exploring such a vast space, particularly for an industrial setting, requires focus in a way that while working toward a target application, knowledge and other opportunities would be revealed. Since those days and across the world many more research groups – mainly in academia – have started working on different aspects of self-organization of nature's building blocks. The list of publications is expansive, which makes it opportune to bring together a number of key papers that cover the state of the art as well as the thinking about the main technical challenges.

With a decade of experience, I have brought together seven papers with a scope limited to self-assembly of peptides, but covering key issues for advancing materials research into product development. The patent literature activity is typically an indicator of commercial interest and application space. Chapter 1 covers in some detail, but without being comprehensive, what self-assembled peptides may bring in terms of material applications. Chapters 2 and 3 explain the underlying principles of peptide self-assembly and how experiment can be used to model the hierarchy of structure formation. Typically, the work on peptides requires a tailored molecular

configuration and Chapter 4 covers the options available for preparing them in sufficient quantities. The remaining chapters focus on the technology and use of the self-assembly mechanism to create specific applications such as "silk fibers," coatings, and scaffolds to name a few. Either an "all" peptide composition can be used or combinations of peptide with synthetic oligomers or polymers – hybrid systems.

The idea to bring this topical volume together was suggested by David West, member of the editorial board but also a very good friend and long time colleague at The Dow Chemical Company. The volume provided a platform to write up most of the things that is known in this field of research, for which I am very grateful as I believe that peptides will become the new materials of the future in view of their versatility

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