

# Preface

The tailoring of well-defined polymer structures upon the surfaces of solid materials constitutes the molecular basis for advanced functional surfaces. The recent advent of a multitude of controlled radical polymerization methods (also called reversible deactivation radical polymerization according to IUPAC), which greatly outperform conventional radical polymerization processes with respect to topological control, has had a major impact on this field. These methods allow for the confinement of polymerizations at surfaces, which may lead to polymer brushes and other surface-bound polymer arrangements. They also provide macromolecular architectures of stunning complexity with relative ease, which were far beyond the wildest dreams of polymer chemists just short time ago. These polymers may have tailored functionalities that can be used for controlling the interface regime between the solid material and the soft polymer coverage. The functionality may also be used to arrange polymer chains and particles in a predetermined manner so that complicated nano-composites emerge. The polymer and its functionality may finally be used to modulate surface functions. All these benefits are currently fully exploited for new surface structures for applications in energy conversion, e.g., solar cells; nanomedicine, e.g., drug delivery and tagging; and materials science, where they are used for the design of functional, responsive, or high mechanical performance nano-composite materials.

This book presents state-of-the art knowledge about all aspects that are important when considering controlled radical polymerization and surfaces. It is intended to guide the interested polymer chemist through the constantly increasing number of scientific studies and should help to apply this knowledge for tailoring novel surfaces. The book starts with four chapters which are dedicated to the four major controlled radical polymerization methods, namely NMP, ATRP, RAFT and RTCP. In the second part of the book, a chapter deals with the specific situations in heterogeneous aqueous media, followed by a contribution about post-modifications of the polymers formed upon surfaces. The book ends with a chapter about how tailored polymer from controlled radical polymerization can be used to fabricate nano-composites. All chapters of this book are by leading scientists in the

respective fields and I express my sincerest gratitude to them that they have contributed in this excellent way to this fine book. I am confident that this issue of APS will help to make further progress in this fascinating field and will help to stimulate the development of new applications both in the field of polymer chemistry and materials science. I am looking forward to these new exciting steps forward.

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Controlled Radical Polymerization at and from Solid  
Surfaces

Vana, P. (Ed.)

2016, VII, 225 p. 110 illus., 64 illus. in color., Hardcover

ISBN: 978-3-319-22137-3