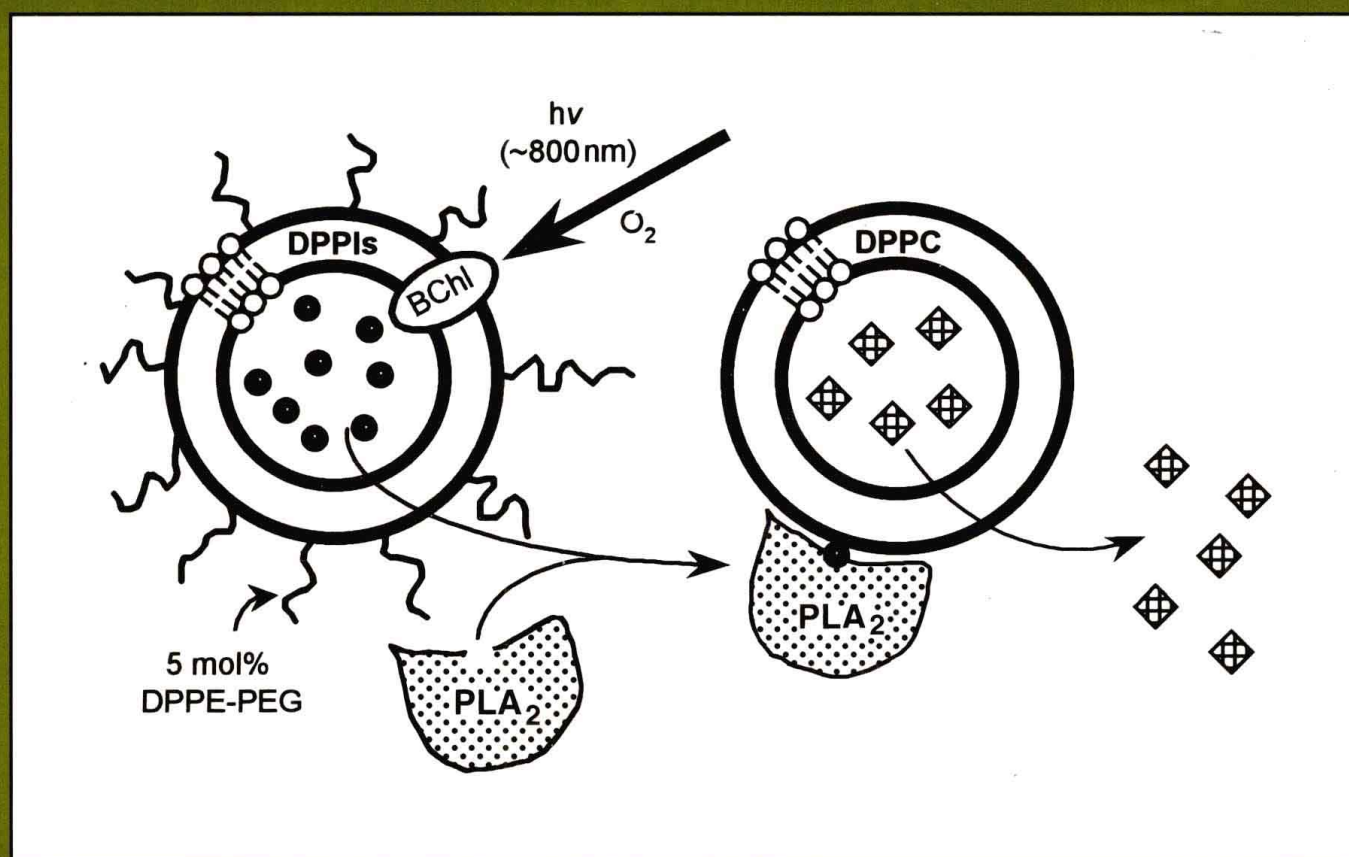


surfactant science series
volume **100**

REACTIONS AND SYNTHESIS IN SURFACTANT SYSTEMS



edited by
John Texter

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*Strider Research Corporation
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Preface

This book presents a review of extant applications of surfactant technology in chemical synthesis as well as chemical reactions and catalysis. The applications and utilization of surfactants in diverse chemistries, including many areas of organic, inorganic, colloidal, surface, and materials chemistry, cover a very wide gamut. With the possible exception of the journal *Langmuir*, no single journal or professional publication ties together all these areas. It is therefore hoped that this volume will help practitioners and students increase the breadth of their appreciation of surfactant systems in various synthetic and practical applications. The burgeoning arena of template synthesis and nanotechnology indicates that major advances in nanoelectronics will not be forthcoming from further miniaturization programs, but must rely on dramatic improvements in the sophistication with which we wield molecular design and synthesis of surfactants and amphiphiles. Self-assembly principles have been clearly delineated, and the time has come to put this technology to work in chemical synthesis and processing technologies. The success of such endeavors will require closer collaboration among synthetic and physical scientists and engineers, and greater appreciation among practitioners in one discipline for the opportunities and limitations of key related disciplines.

The present volume is extremely wide in scope, covering a broad swath of organic, inorganic, surface, and colloidal chemistry and materials science united by the universal use of surfactant and amphiphile technology in each application. While the volume may seem too synthetic for some readers and too physical for others, it is intended to bring together many related areas and to facilitate closer collaboration between synthetic and physical practitioners in developing new applications and materials. The genesis of this broad arena is found in micellar catalysis, monolayer studies at the water–air interface, and inorganic particle precipitation. Although the general principles of monolayer formation at air–water interfaces and in self-assembled monolayers appear well defined, the controlled multilayer formation of composites, using surfactant templating and molecular recognition principles, is at an early stage in the development of practical applications and processes. Compartmentalization of reactants, as effected by self-organization in surfactant systems, is providing size and morphology control in synthesizing nanoparticulate inorganics and organics. These nanoparticulates are being incorporated into controlled arrays on mesoscales in furthering practical device development. While it was the editor's intention to cover all major application areas, some areas will regrettably have been overlooked, and for these omissions the reader is extended an apology. It is hoped that this book will stimulate readers to invent new applications areas, as naturally occurs in the bridging of disciplines.

The first of the five general parts of this volume comprises surfactant syntheses and electrochemical transformations. Part Two is basically physical–organic chemistry in surfactant systems. Included are micellar catalysis, reaction chemistry in microemulsions, electrocatalysis and electrosynthesis in various surfactant systems, and diverse applications involving emulsions, microemulsions, and vesicles. Parts Three and Four are focused on particle formation, organic and inorganic. Part Three addresses the role of surfactants in organic polymerizations and also provides a thorough review of polymerizable surfactants. Part Four examines particle formation and the role of

surfactants in compartmentalizing precipitation chemistries, such as in reverse microemulsions and at surfactant interfaces. The precipitation of inorganic nanoparticles is not treated exhaustively, since an excellent recent volume edited by Tadao Sugimoto, *Fine Particles: Synthesis, Characterization, and Mechanisms of Growth* (Volume 92 of the Surfactant Science Series) treats this topic thoroughly. Part Five addresses syntheses and processing, via self-assembly, molecular recognition, and surfactant templating, on the supramolecular level. These categories cover a variety of themes, including:

Organic chemistry as influenced by surfactants and surfactant assemblies,

The production of organic particulates by chain polymerization in surfactant systems and by polymerizable surfactants,

The synthesis of inorganic nanoparticles using compartmentalized reaction chemistry,

The synthesis of supramolecular assemblies using surfactant assemblies as templates,

The formation of multilayer composites using surfactants and other growth-directing materials.

The interdisciplinary content presented bridges numerous areas of chemistry and materials science, including colloid and surface chemistry, organic synthesis and catalysis, inorganic synthesis and catalysis, electrochemical synthesis and electrocatalysis, inorganic–organic composites, and template-directed synthesis of mesoporous materials. This interconnected bridging makes this volume of interest to chemists and materials scientists of many persuasions. This volume is aimed at practicing industrial and academic scientists and engineers and at students involved in chemical and particle synthesis and processing.

Nearly 100 contributors collaborated in producing the 40 diverse chapters of this volume. I thank each of the authors for their contributions and patience as the volume progressed. I also thank my acquisitions editor, Anita Lekhwani, for her cheerful collaboration, and our production editor, Joseph Stubenrauch, for steadfastly coaxing and urging the volume forward and onward to completion.

John Texter

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