Preface

The building blocks currently used for organic functional materials are mostly synthesized from starting materials derived from fossil fuel resources, but the overdependence of these sources is associated with chemical pollution and resource depletion. Therefore, there is growing scientific and technological attempts to utilize renewable resources as a feasible alternative for fossil fuel resources. Renewable resource-based organic synthesis has distinct advantages for the generation of new building blocks since (a) they are obtainable from renewable resources and (b) they are cheap and widely available. Amongst the various renewable resource raw materials, the cashew nut shell liquid (CNSL), which is an industrial waste and pollutant from the cashew nut processing industry, has gained a renewed interest in recent times owing to its wide availability and easy isolation. CNSL is a unique natural source for unsaturated long-chain phenols. Traditionally, this renewable material has wide applications in the form of brake linings, surface coatings, paints, and varnishes. Cardanol is a phenol obtained from anacardic acid, the main component of technical CNSL, by thermal decarboxylation during vacuum distillation. Cardanol has a unique structure which allows a variety of functional groups to be introduced to the molecule for derivatization. This book is an effort to summarize the research on the utilization of CNSL as a starting material for the synthesis of advanced functional materials.

This book is organized into a collection of 10 chapters. Chapter 1 describes the downsides of the overdependence of fossil fuel resources and the importance of finding sustainable crop-based alternatives. Chapter 2 is focused on the origin and chemical compositions of the different types of CNSL and utilization of its major component cardanol. This chapter details the various methods involved in the isolation of cardanol from CNSL and describes some of the basic chemistries involved in cardanol utilization. Chapter 3 reviews the chemistries involved in the synthesis of heterocyclic compounds from CNSL-based starting materials. This chapter also describes some applications of porphyrins synthesized from cardanol. Chapter 4 outlines various monomeric and polymeric surfactants derived from cardanol and its applications. Chapter 5 discusses the liquid crystalline properties of molecules and polymers derived from cardanol. The chapter also describes the interesting nonlinear optical properties exhibited by cardanol-based materials. Chapter 6 describes the utilization of cardanol-derived amphiphilic molecular assemblies as a template for conducting polymer nanostructures and also explains the influence the amphiphiles on the physical properties of the template polymer nanostructures. Chapter 7 is focused on self-assembled gel formation associated with cardanol derivatives. Also, indicated are some of the potential applications of cardanol molecular gels. Chapter 8 discusses the use of CNSL-derived molecules in medicinal applications such as cancer therapy, drug-delivery, and imaging applications. Chapter 9 reviews the research on the synthesis of step-growth polymers using cardanol-derived difunctional monomers. This chapter also highlights the performance of these classes of polymers with special stress on processability and thermal properties. Chapter 10 gives an industrial perspective on the utilization of CNSL-derived molecules and polymers. This chapter outlines a broad spectrum of high-performance industrial products and formulations beads on CNSL.

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Vancouver, BC, Canada Parambath Anilkumar

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