Preface

The present volume constitutes an integral part of the monograph series on *Engineering Dielectrics* and concerns the electrical behavior and properties of insulating liquids. Some material on measurement techniques is also included in so far as it may be different from that, or is not described fully, in Vol. IIB, which is devoted to measurement techniques mainly as applied to solid dielectrics. Volume III is a precursor of Vol. IV, which deals primarily with the subject of electrical solid-liquid insulating systems.

A total of five chapters comprise Volume III. The electrical characteristics of insulating liquids are treated from the fundamental point of view in the first two chapters. Chapter 1 deals with the permittivity and dielectric loss and provides as well a description of the test methods and specimen cells particularly devised for the measurement of the dielectric properties of liquids over the entire frequency spectrum, extending into the optical frequency range. Since the vast majority of insulating liquids are utilized at power frequencies, a substantial amount of effort is expended in discussing the dielectric behavior at these frequencies. However, the dielectric frequency response of insulating liquids is also given considerable attention in that it permits to establish the nature of the dielectric loss at power frequencies and simultaneously reveals some pertinent data on the molecular structure of the liquids and on the manner in which that structure influences the dielectric loss and permittivity behavior. Chapter 2 considers the fundamental conduction processes, formation of space charges and prebreakdown and breakdown mechanisms from the quantitative point of view. The latter material prepares the reader for an introduction into Chapter 3, which presents a qualitative account of the phenomenological events that precipitate the electrical breakdown of liquids. Chapter 4 discusses the physical and chemical properties of mineral oils and provides a description of the various test methods for determining these properties. Finally, Chapter 5 considers the general molecular structural nature of insulating liquids and their composition.

Both SI and CGS-Gaussian units are employed in this volume as well as throughout the entire monograph series. The concurrent use of the two systems of measure is intentional, since it is desirable to remain *aufait* with both systems in order to sustain a fluently conversant link between the more recent and early parts of the literature on dielectrics. Useful conversion factors between the different systems of units are given in the appendices; a detailed treatment on the various systems of measure and their evolvement may be found in Vol. IIB.

I wish to take the opportunity to thank all the contributing authors of this volume as well as their respective institutions for the contribution of their valuable engineering time. My sincere thanks are also extended to Drs. H. Sharbough and W. Starr for their reading of, and constructive comments on, the manuscripts; in the same respect, I greatly appreciate the helpful comments received from Committee D27 on Electrical Insulating Liquids and Gases, who graciously joined D9 in cosponsoring Volume III. My thanks are equally due to the editing staff of ASTM for their assistance. I am grateful to my own institution for its encouragement, support, and permission for my continuing work on the monograph series. Since a substantial portion of my time and effort has been spent in my own premises, I am most grateful to my wife Margaret and my two children, Andréa and Thomas, for their patience.

*Varennes, Sept. 18, 1991*

*R. Bartnikas*