

Preface

Human hair is a nanocomposite biological fiber. Maintaining the health, feel, shine, color, softness, and overall aesthetics of the hair is highly desired. Hair care products such as shampoos and conditioners, along with damaging processes such as chemical dyeing and permanent wave treatments, affect the maintenance and grooming process and are important to study because they alter many hair properties. Nanoscale characterization of the cellular structure, mechanical properties, and morphological, frictional, and adhesive properties (tribological properties) of hair are essential to evaluate and develop better cosmetic products and to advance the understanding of biological and cosmetic science. The atomic/friction force microscope (AFM/FFM) and nanoindenter have become important tools for studying the micro/nanoscale properties of human hair. In this book, we present a comprehensive review of structural, nanomechanical, and nanotribological properties of various hair and skin as a function of ethnicity, damage, conditioning treatment, and various environments. Various cellular structures of human hair and fine sublamellar structures of the cuticle are identified and studied. Nanomechanical properties such as hardness, elastic modulus, tensile deformation, fatigue, creep, and scratch resistance are discussed. Nanotribological properties such as roughness, friction, and adhesion are presented, as well as investigations of conditioner distribution, thickness, and binding interactions. To understand the electrostatic charge buildup on hair, surface potential studies are also presented.

The book should serve as a reference book on the biophysics of human hair and hair treatments.

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