

**Inorganic-Whisker-
Reinforced Polymer
Composites**
Synthesis, Properties
and Applications

Qiuju Sun • Wu Li

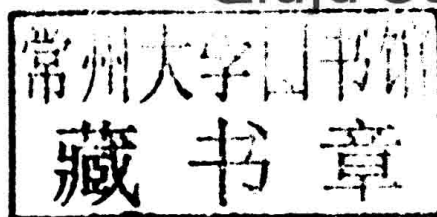


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Inorganic-Whisker- Reinforced Polymer Composites

Synthesis, Properties and Applications

Preface

Inorganic whiskers are acicular single-crystal fiber materials with certain length-to-diameter ratios and excellent physico-chemical properties and good mechanical properties, such as high strength, high hardness, and high heat resistance. Filled into polymers, inorganic whiskers can improve the strength, toughness, wear resistance, heat resistance, and processing performance of polymers, and therefore have become a new type of filling modification material. This book first discusses the importance of the modification of polymer materials, followed by a description of the variety, characteristics, surface treatment, and evaluation methods of inorganic whiskers in the market. It then summarizes the preparation methods and performance analysis of polymers filled with inorganic whiskers. Finally, based on the authors' years of study of calcium carbonate whiskers as fillers, this book introduces the surface treatment methods for and factors influencing calcium carbonate whiskers. Combined with a consideration of research on polypropylene filled with calcium carbonate whiskers, this book systematically and comprehensively discusses the main preparation methods and possible problems and solutions, and summarizes the latest applications and research progress on polymers filled with inorganic whiskers in China and elsewhere.

This book will be useful for teachers, researchers, and master's and PhD students in the fields of polymer materials

and engineering at universities and research institutes. It also provides a reference for technology developers in the relevant fields in the industry.

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Qiuju Sun
Wu Li

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Chapter 1

Introduction

A substance that can meet specific morphological and physical performance requirements is referred to as a material. Materials are vital to modern industrial and high-tech advances, constituting an important basis for human survival and development. Materials can be divided according to their chemical composition into metallic, inorganic nonmetallic, and organic polymer materials. Metallic materials are composed of metal atoms such as iron, copper, aluminum, and alloy steel. Inorganic nonmetallic materials are composed of inorganic compounds such as glass, ceramics, and cement. Organic polymer materials are composed mainly of two elements—carbon and hydrogen—with C–C covalent bonds forming their basic structure; examples of such compounds include cottons, linens, silks, plastics, rubber, synthetic fibers, and others.

As a rising star in the field of materials, polymer materials have widespread applications because of their unique features, such as availability of raw materials, low cost, low density, favorable optical activity, diversity, high mechanical strength, chemical resistance, and excellent insulation properties. Furthermore, polymer materials can also adapt to various needs, have good processibility, and are suitable for automatic production, and have therefore become an essential material in our everyday lives.