Introduction

Amorphous carbon (also known as diamondlike carbon) has been available for almost 20 years. During the 1980's, the interest in these films increased. In the late 1980's, the Materials Research Society (both the American and the European MRS) and other societies held sessions devoted to this area. In many cases, proceedings of these conferences were published. However, papers submitted to these proceedings were limited in length and scope. On the other hand, several review articles were published. The papers did not cover, in detail, all the aspects of this field. It was evident that a gap existed. There was no single book describing, in detail, the most important work done in the last several years in the field. In order to fill this gap, Dr. Fred Wohlbier (Trans Tech Publications) invited us to edit this book.

There are two main purposes to this book: first, to give a scientist starting to work in the field a way to know, in detail, the state-of-the-art; second, to give researchers in the field a more complete description of work done in laboratories all over the world without looking for the original publications. In addition, the book can serve as a reference book for people not working in the area.

The book is divided into four sections: general reviews, preparation methods, characterization and applications. Each section contains several invited chapters. In many cases, a chapter could be classified under more than one section. Most of the chapters summarize the work that has been done over several years. These chapters contain preparation, properties and, in many cases, applications. Therefore, in these cases, the classification of the chapters may look somewhat arbitrary.

The first section contains general review chapters starting with Dr. Aisenberg, a pioneer in the field. Large effort in this area is described by Prof. Koidl and his group, while Drs. Tsai and Green review a large number of preparation methods, properties and applications. Dr. Robertson gives a general overview and describes his own work in the theoretical area. We also invited a chapter in the area of diamond films, which is a new area and is closely related to amorphous carbon films. This chapter is given by the Penn State group, which is one of the largest groups in the U.S.A.

The section covering preparation methods includes chapters on film preparation using the plasma technique (Catherine), ion beam techniques (Hirvonen, Mirtich, Lifshitz) and other methods (Renschler). The effects (Berg) encountered in the film preparation are also described. It should be mentioned that preparation methods are also given in detail in the first section (Aisenberg, Koidl, Green) and in some chapters in the subsequent two sections.

Each of the first four chapters in section III describes the application of a single characterization technique to amorphous carbon films. The four techniques are optical (Smith), real time ellipsometry (Collins), Raman spectroscopy (Yoshikawa) and nuclear magnetic resonance (Petrich). The other chapters in this section describe the effects of radiation on amorphous carbon (Savvides, Kalish and Ingram) and a combination of characterization methods (Fitzgerald, Thompson and Gonzalez-Hernández).
The last section describes some of the applications of amorphous carbon films. Each of the first two chapters (by Profs. Enke and Woollam) describes several applications, e.g. optical, electrical and mechanical. Tribological and mechanical properties of metal-containing (Klages) and normal carbon films (Miyoshi and LaFontaine), sensors (Olcaytug) and photoconduction (Itoh) are described in the remainder of this section.

The book does not cover all the areas dealing with amorphous carbon films. There is a limit to both the scope of this book and the ability to collect up to date material. However, we believe that we covered the most important aspects of preparation, characterization and applications.

The invited chapters are of high scientific quality and up to date results are presented. We believe that the book will be used extensively by researchers already in the field, new comers, and researchers that need a general reference to this new and developing area.

We would like to thank all authors for their contributions, without which this book could not be published.

John J. Pouch
Samuel A. Alterovitz
Cleveland, Ohio, U.S.A.

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