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CVD of Nonmetals; Contents; 1 . Introduction; 1.1 Organization of the Book; 1.1.1 Scope of the Book; 1.1.2 Potential Audience; 1.1.3 Selection of Chapter Topics; 1.1.4 Chapter Organization; 1.1.4.1 Cross-References Between Chapters; 1.1.4.2 Where to Find a Topic; 1.2 Uses of Materials; 1.2.1 Electronic Applications; 1.2.1.1 Band Gap Classifications; 1.2.2 Optical Applications; 1.2.3 Structural Applications; 1.3 Comparison of Deposition Techniques; 1.3.1 Comparison of Chemical Vapor Deposition Sub-Techniques; 1.3.1.1 Organometallic Vapor Phase Epitaxy (OMVPE); 1.3.1.2 PlasmaCVD; 1.3.1.3 PhotoCVD; 1.3.1.4 Pressure Modifications in CVD; 1.3.1.5 Spray Pyrolysis Modifications; 1.3.2 Comparison of Non-Chemical Vapor Deposition Technologies; 1.3.2.1 Molecular Beam Epitaxy (MBE); 1.3.2.2 Other Physical Vapor Deposition Techniques; 1.4 General Comments on CVD; 1.4.1 Reactor Types; 1.4.2 Important Reaction Locations in CVD Reactors; 1.5 Experimental Design; 1.5.1 System Configuration; 1.5.1.1 System Reactant Input; 1.5.1.2 Reaction Zones; 1.5.1.3 Reaction Co-Product Removal System; 1.5.2 Handling of Precursors; 1.5.3 Methods of Energy Input; 1.5.3.1 Thermal CVD; 1.5.3.2 Alternate Modes; 1.5.4 Vapor Analysis in CVD; 1.6 Reaction Kinetics in CVD; 1.6.1 General Comments; 1.6.2 Vapor Phase Reactions; 1.6.3 Vapor-Solid Phase Reactions; 1.6.4 Solid Phase Reactions; 1.6.5 Control of Reaction Location; 1.6.6 Rate-Determining Steps in CVD; 1.6.7 Temperature and Growth Rate Effects; 1.7 Thermodynamics in CVD; 1.8 General Comments on Precursors; 1.8.1 Design Considerations; 1.8.2 Structural Motifs; 1.8.3 Mechanistic Insights; 1.9 References; 2 . Superconducting Materials; 2.1 Introduction; 2.2 Overview of Superconductivity; 2.2.1 Physical Properties of Superconductors; 2.2.2 Low Temperature Superconducting Materials; 2.2.2.1 Crystal Structures of LTS Materials; 2.2.3 High Temperature Superconducting Materials; 2.2.3.1 Crystal Structure of HTS Materials; 2.2.4 Applications of Superconductors; 2.2.4.1 Large-Scale Applications of Superconducting Magnets; 2.2.4.2 Low-Field Applications of Superconductors; 2.2.4.3 Superconducting Electronics Applications; 2.3 CVD of LTS Materials; 2.3.1 Nb₃Sn CVD Film Growth; 2.3.1.1 Nb₃Sn CVD Precursors and Reaction Schemes; 2.3.1.2 Nb₃Sn CVD Reactor Design; 2.3.1.3 Substrates for Nb₃Sn CVD; 2.3.1.4 Physical Properties of CVD-Derived Nb₃Sn Films; 2.3.2 Nb₃Ge CVD Film Growth; 2.3.2.1 Nb₃Ge CVD Precursors and Reaction Schemes; 2.3.2.2 Nb₃Ge CVD Reactor Design; 2.3.2.3 Physical Properties of CVD-Derived Nb₃Ge Films; 2.3.2.4 Films Effects of Chemical Doping Upon Physical Properties of CVD-Derived Nb₃Ge; 2.3.3 NbC_{1-y}N_y CVD Film Growth; 2.3.3.1 NbC_{1-y}N_y CVD Precursors and Reaction Schemes; 2.3.3.2 Reactor Design for CVD of NbC_{1-y}N_y on Carbon Fiber; 2.3.3.3 Physical Properties of CVD-Derived NbC_{1-y}N_y Films; 2.3.4 NbN CVD Film Growth; 2.3.4.1 NbN CVD Precursors and Reaction Schemes

Written by leading experts in the field, this practical reference handbook offers an up-to-date, critical survey of the chemical vapor deposition (CVD) of nonmetals, a key technology in semiconductor electronics, finishing, and corrosion protection. The basics necessary for any CVD process are discussed in the introduction. In the following chapters, precursor requirements, with an emphasis on materials chemistry, common structures of reactants and substrates, as well as reaction control are discussed for a broad range of compositions including superconducting, conducting, semiconductin