同軸型アークプラズマ堆積法により作製したn型超ナノ微結晶ダイヤモンド膜の創製に関する研究

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Ultrananocrystalline diamond (UNCD)/hydrogenated amorphous carbon (a-C:H) composite (UNCD/a-C:H) film, which is a new diamond and related materials, are attractive much attention as a photodetector, field emission source, hard coatings, and micro/nano-electro mechanical systems (MEMS/NEMS) because of its specific film structure.

The scope of this study is to propose n-type doping on the UNCD/a-C:H films prepared by coaxial arc plasma deposition (CAPD) since production of n-type diamond and related materials is most important issue to substantiate electrical applications mentioned above.

Chapter 1 introduces a position of UNCD/a-C:H films in materials fields by comparing another diamond and related materials. From a results of this review, potential applications of UNCD/a-C:H is considered from basic physical background and growth techniques of that.

Chapter 2 shows the experimental methods including apparatus setup, sample preparation conditions, and evaluation methods. The UNCD/a-C:H films are prepared by coaxial arc plasma deposition (CAPD), which has distinctive features for industrial application. Electrical and structural characteristics of that are evaluated by pan der Paw, current–voltage (I–V), capacitance–voltage (C–V), and several spectroscopic analysis. Details of those are summarized in this chapter.

Chapter 3 investigates lithium and phosphorus doping effect on the films on the basis of the experimental results obtained from electrical and structural analysis. The enhancement of electrical
conductivity is discussed spectroscopic analysis.

**Chapter 4** provides nitrogen-doped ulrananocrystalline diamond/hydrogenated amorphous carbon composite films prepared in hydrogen and nitrogen mixed-gas atmospheres by coaxial arc plasma deposition with graphite targets were studied electrically and chemical-bonding-structurally. The electrical conductivity was increased by nitrogen-doping, accompanied by the production of n-type conduction.

**Chapter 5** summarizes this work. As mentioned above, this thesis electrically and structurally investigate the n-type semiconducting properties of UNCD/a-C:H films prepared by CAPD, and firstly demonstrate the high potential for electronical applications.