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論文審査委員	主査　教　授　酒井　俊郎 教　授　樽田　誠一 教　授　錦織　広昌 准教授　清野　竜太郎 教　授　内海　重宜（公立諏訪東京理科大学）

論 文 内 容 の 要 旨

The present thesis is organized into eleven chapters. The first chapter presents a general introduction of nanodiamonds, the state of art on the study of their water adsorption, hygroscopic behavior and influence of water adsorption on their electrical conductivity, and the justification of this research. The second chapter gives basic knowledge of gas adsorption as a means of evaluating the pore structure of nanodiamond aggregates. Chapters three, four, six, seven and eight are based on published papers. The third chapter presents the characterization of nanodiamond aggregates by scanning electron microscopy, transmission electron microscopy, electron energy loss spectroscopy, X-ray diffraction, X-ray photoelectron spectroscopy, adsorption of nitrogen at 77 K and water at 298 K. This characterization shows that nanodiamonds are porous aggregates of sp^3-hybridized carbon particles surrounded by sp^2-hybridized graphene-like carbon (partially oxidized graphene-like carbon). The adsorption and molecular simulation studies elucidated the origin of the hygroscopic nature of nanodiamonds; the hygroscopic nature of nanodiamonds stems from hydrophilic mesopore walls having surface functionalities and ultramicropores between the graphitic shell and nanodiamond particle. The fourth chapter shows the influence of thermal heating (423 K to 623 K) for 2 h on the selective sites for water adsorption in nanodiamond aggregates, showing that the higher the heating temperature in *vacuo*, the larger the amount of water-selective adsorption sites. The fifth chapter presents the influence of thermal heating for 52 h on the pore structure of nanodiamond aggregates. The prolonged heating (423 K for 52 h) induces an anomalous water adsorption behavior due to pre-removal of strongly bound water molecules from nanodiamonds. The sixth chapter compares the hygroscopic nature of nanodiamonds and other well-known materials. The water absorption capacity of nanodiamonds is comparable to that of the clay Montmorillonite and higher than those of the zeolites ZSM-5 and molecular sieve 5A. The seventh chapter shows the changes in the electrical conductivity of pre-adsorbed water nanodiamonds. The eighth chapter shows a supplementary study on water adsorption on SWCNH, which gives the key to understand the hygroscopic behavior of nanodiamonds. The ninth chapter is about the determination of the nanodiamond structure more accurately by SAXS, which is essential to understand the hygroscopic nature of nanodiamonds. The tenth and eleventh chapters show general conclusions and the scientific products from the present research.