

論文 / 著書情報
Article / Book Information

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| 題目(和文) | |
| Title(English) | Dispersion and Functionalization of Inorganic Nanotubes by Covalent or Noncovalent Methodologies |
| 著者(和文) | KIMDUKEUN |
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| 出典(和文) | 学位:博士(工学), 学位授与機関:東京工業大学, 報告番号:甲第9437号, 授与年月日:2014年3月26日, 学位の種別:課程博士, 審査員:芹澤 武,高田 十志和,安藤 慎治,大塚 英幸,川内 進 |
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| 学位種別(和文) | 博士論文 |
| Category(English) | Doctoral Thesis |
| 種別(和文) | 論文要旨 |
| Type(English) | Summary |

(博士課程)
Doctoral Program

論文要旨

THESIS SUMMARY

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| 専攻 : Department of | 有機・高分子物質 | 専攻 | 申請学位 (専攻分野) : Academic Degree Requested | 博士 (工学) |
| 学生氏名 : Student's Name | 金 徳恩 | | 指導教員 (主) : Academic Advisor(main) | 芹澤 武 |
| | | | 指導教員 (副) : Academic Advisor(sub) | |

要旨 (英文 800 語程度)
Thesis Summary (approx.800 English Words)

The PhD thesis is entitled Dispersion and Functionalization of Inorganic Nanotubes by Covalent or Noncovalent Methodologies. This thesis is divided into the seven chapters.

Chapter 1 describes general introduction. In this chapter, the background of the whole research, including synthetic methods, features, potential applications and fatal issues of carbon nanotubes (CNTs) and boron nitride nanotubes (BNNTs), were concretely entered, and object of this thesis was thoroughly introduced.

Chapter 2 describes dispersion of nanotubes in water by simple aromatic molecules. In this chapter, the nanotubes were functionalized by simple aromatic molecules such as derivative of naphthalene, anthracene, and pyrene. Their dispersion and isolation capabilities were characterized by Ultraviolet-visible-near infrared (UV-Vis-NIR) measurements and Atomic force microscopy (AFM) observation, indicating that pyrene carboxylic acid had highest dispersion and isolation capability. It was suggested that number of aromatic rings and substituted groups were significant parameters for dispersion and disentanglement of nanotubes.

Chapter 3 describes dispersion of nanotubes in water by pyrene-conjugated peptides. In this chapter, pristine nanotubes were noncovalently functionalized using pyrene-conjugated peptides, leading to the excellent dispersed and disentangled nanotubes in water. Depending on the dispersing methods, UV-Vis-NIR spectra showed that the novel dispersing method induced not only the great dispersion capability but also the high stability of nanotubes in aqueous phase.

Chapter 4 describes noncovalent functionalization of CNTs with CdSe nanoparticles. In this chapter, CNTs were functionalized using CdSe nanoparticles via electrostatic interactions between the negatively charged CNTs and the positively charged CdSe. The construction of nanohybrids was confirmed by various observation including X-ray diffraction, X-ray photoelectron spectroscopy, and Fourier transform infrared. Optical properties of nanohybrids were investigated from ultraviolet-visible, exhibiting that CNT-CdSe nanohybrids show the specific absorption spectra, which is diffident from that of the pure-CdSe. It was suggested that surface electron of CdSe nanoparticles are redistributed and delocalized by electrostatic

interaction with CNTs.

Chapter 5 describes covalent functionalization of CNTs with CdSe nanoparticles. In this chapter, CNTs were functionalized by CdSe nanoparticles with three types of diamine as linking agents, which have different length of alkyl chain, to form the chemical reaction. Photoluminescence spectra indicated that depending on the alkyl chain of linking agents, nanohybrids exhibited the different emission intensity. It was suggested that distance between CdSe and nanotubes was important point for the luminescence property.

Chapter 6 describes chemical peeling of BNNTs in proper alcohols via sonication treatment. In this chapter, BNNTs were dispersed in various alcohol solvents such as methanol, ethanol, propanol, butanol, pentanol, and hexanol, suggesting that BNNTs can be dispersed in alcohol solvents, excepting methanol, and peeled in proper alcohols with alkyl chains as long as butanol under the strong sonication. Theoretical analysis and FT-IR measurement were applied to gain insight into the peeling mechanism, speculating that following up a zigzag path, cleaving of BN bond was occurred through the nucleophile reaction from oxygen to the boron atom.

Chapter 7 describes conclusion. In this chapter, the important results from each chapter are remarked and summarized. The prospective and possibilities directions of the nanotube research in the future are discussed.

備考：論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。

Note : Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1 copy of 800 Words (English).