UE03

Selective patterning of quantum dots on functionalized surface

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Quantum dots, nanoparticles of inorganic semiconductor, have attracted considerable interests due to their unique optical properties from quantum sized effects [1]. They have been extensively applied to various potential applications including fluorescent biological label, organic light emitting diodes (OLEDs), field emission display, single electron transistors, and optical sensors. Those quantum devices requires precise and accurate pattern of nanoparticles on desired area. Thus, the ability to selectively immobilize nanoparticles with ordered structure onto solid substrate is of a great importance [2].

In this study, we reported a simple method to pattern quantum dots, CdSe/ZnS, on selectively functionalized surface. The process steps are summarized schematically in Fig. 1. This selective patterning of the quantum dots solution can be understood by considering the difference in affinity owing to different chemical functionality between the charge of quantum dots and transferred polyelectrolyte (Fig. 2). The approach introduces some advantages. First, quantum dots can be easily deposited on desired surface by simple dipping method. And quantum dots having different functional chemical groups can also be used for patterning because the engineered surface has ability to selectively adsorption of CdSe/ZnS through strong electrostatic interaction. Secondly, the patterned shape and size can be freely controlled by elegant polymer transfer technique according to the variation of used microstamp. Third, the roughness and topography of the functionalized surface can be easily modulated by the different thickness of polyelectrolyte multilayers during the process of polymer transfer.

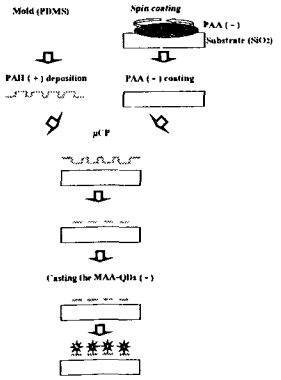

Fig. 1. Schematic diagram of selective QDs patterning

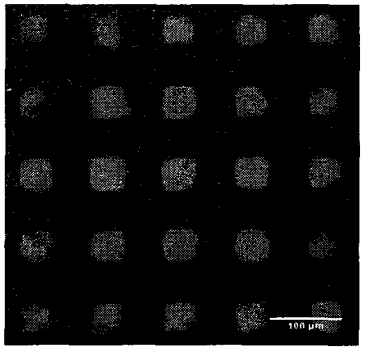

Fig. 2. Fluorescent image of QDs patterning

REFERENCES

[1] Beverly KC, Sample JL, Sampaio JF, Remacle F, Heath JR, Levine RD. Proc Natl Acad Sci U S A **2**, 6456 (2002)

[2] Jacobs HO, Whitesides GM. Science **291**, 1763 (2001)

UE04

Preparation and characterization of chemically activated electrospun carbon nanofibers

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Introduction

As adsorption materials, porous carbons have been used widely for purification, separation, and recovery process due to their large surface area and porosity [1]. It is well known that there are many applications according to the pore size distribution. Because carbon fibers have various characteristics with different pore structures and pore size distribution [2]. So it is essential that the pore size be controlled.

Experimental

PAN-based carbon nanofibers(CNFs) were prepared by using electrospinning method. CNFs were immersed in $NaOH/K_2CO_3$ solution with various concentration. Wet CNFs were placed at alumina boat in steel pipe for chemical activation. Activation of CNFs was conducted at 750°C for 3 h in nitrogen gas. Activated CNFs were washed with distilled water several times and dried at 110°C over night.

Results and Discussion

Comparing sample A and sample C in Table 1, BET specific surface area increased from 16.7 to 537.2 m^2/g through K_2CO_3 activation. Total pore volume increased from 0.028 to 0.357 cc/g about 13 times. Potassium carbonate activated CFs were highly microporous.

Table 1. The condition of Immersing solution and textual properties of resultant CNFs

solution concentration (mol)	A	B	C	D	E	F	G
Immersing K_2CO_3 solution (mol)	-	2	4	-	-	-	-
Immersing NaOH solution (mol)	-	-	-	2	4	6	8
BET specific surface area (m^2/g)	16.7	537.2	527.9	868.3	1804.4	1867.8	1933.2
Total pore volume (cc/g)	0.028	0.357	0.272	0.397	0.991	1.119	1.459
HK micro pore volume (cc/g)	0.018	0.309	0.227	0.356	0.751	0.575	0.705

BET specific surface area of NaOH activated CNFs(sample G) increased about 116 times comparing sample A. Total pore volume increased from 0.028 to 1.459 cc/g. Even though micro pore volume increased about 2 times, mesopore developed more than micropore.

Specific surface area and total pore volume increased by chemical activation. NaOH activation is more effective than K_2CO_3 activation to increase specific surface area. Regarding the pore size distribution, K_2CO_3 activation is good for highly microporous CNFs and NaOH activation is for developing both micro and mesopores on CNFs.

REFERENCES

[1] D. F. Quinn, J.A. Macdonald: Natural gas storage, Carbon Vol. 30 (1992), p.1097.

[2] M. G. Deng, Y.H. Feng, B.C. Yang: Carbon Science Vol. 6 (2005), p. 86.