NANOFIBER-NANOWIRE COMPOSITE AND THE MANUFACTURING METHOD OF THE SAME

Affiliation : Korea university **Type of Partnership :** Open for negotiation **Cost :** Open for negotiation
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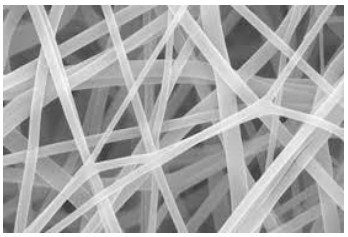
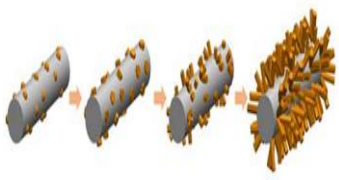




<A procedure of growing ZnO nanoparticles into nanowires in a hydrothermal reaction>

Abstract

The present invention is related to a composite produced by synthesizing a nanofiber including metal-oxide nanoparticles in a biodegradable polymer solution and to grow a metal-oxide nanowire from the nanofiber through a hydrothermal method.

Problems with Existing Technology

Deep coating which is a manufacturing method of a composite of nanofiber-nanowire is needed to solve the problem of non-uniform attachment and performing a treatment additionally.

- Since the amount of nanoparticle is determined depending on dipping time of the solution, deep-coating method is not easy to adjust a density. Due to these phenomena, stability of a nanofiber subjected to deep coating is reduced. This may be overcome by additionally performing a heat treatment for structural stability and immobilization of the nanoparticle.
- There is a need for a novel method for producing a composite of two types of materials such as a form in which a nanowire is bound to a nanofiber.

Technology Readiness Level

TRL 5 : Technology validated in relevant environment

TRL1	TRL2	TRL3	TRL4	TRL5	TRL6	TRL7	TRL8	TRL9
Basic Technology Research	Technology Concept formulated	Experimental Proof of Concept	Technology validated in lab	Technology validated in relevant environment	Technology demonstrated in relevant environment	System Prototype in operational environment	System complete& qualified	Full commercial application

Differentiation and Effect

Differentiation

Nanofiber-nanoparticle composite may be easily produced

- It may be produced by electrospinning the polymer synthesis solution.
- In order to disperse nanoparticles to a polymer synthesis solution, the dipolar solvent may allow the nanoparticles to be uniformly dispersed in an organic solvent in which a polymer is dissolved.
- A nanowire may be grown without performing an additional process on a nanofiber-nanoparticle composite.

Effect of Technology

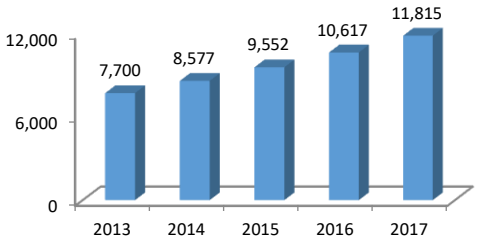
Utilizing biodegradable polymer solution to nanofiber-nanowire composite

- Nanofiber-nanowire composite is bio-friendly by using a biodegradable polymer and is decomposed in a living body with the lapse of time.
- Since the nanofiber-nanowire composite is harmless to a human body.
- It has cell-compatibility and may be applied to various biomedical fields such as medical materials, tissue regeneration, biosensors, drug delivery, and cosmetics.

Technology Application Field

It can be used in various fields such as photocatalysts, sensors, beauty treatments, and gene transfer and therapy.

Market Trends



S&T Market Report, 2016

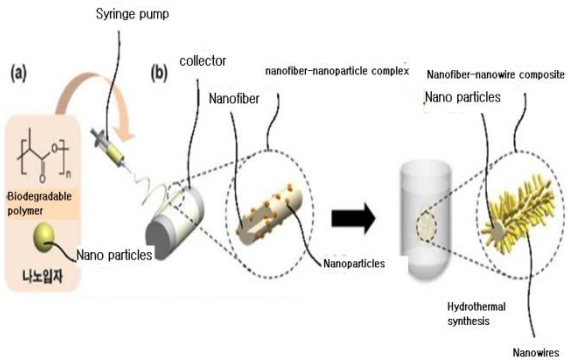
<Prospects of functional nanomaterial market, million USD>

- The global market for functional nanomaterials (carbon nanomaterials, optical system and graphenes) grew from $77 million in 2013 to $11,815 million in 2017.
- The domestic market for functional nanomaterials (carbon nanomaterials, optical system and graphenes) has grown from 837.5 billion won in 2013 to KRW 12,71.7 billion in 2017.

Technology Implementation

Synthesis method of zinc-oxide (ZnO) nanoparticle

- A dipolar solvent (e.g., ethanol) is used to disperse nanoparticles to a polymer synthesis solution. The dipolar solvent may allow the nanoparticles to be uniformly dispersed in an organic solvent in which a polymer is dissolved. The nanofiber-nanoparticle composite may be produced by electrospinning the polymer synthesis solution.
- In the case of a zinc-oxide nanoparticle, a nanowire may be grown using a hydrothermal method.



<A process chart showing the manufacturing process of the nanowire composite. >

List of related patents

No.	Title of Invention	Patent No./ Application No.
1	NANOFIBER-NANOWIRE COMPOSITE AND PREPARATION METHOD THEREFOR	PCT/KR2017/000343
2	NANOPARTICLE-POLYMER FLUORESCENT COMPOSITE AND METHOD OF PREPARING THE SAME	US 16/099,352
3	METALLIC NANOSPRING AND METHOD FOR MANUFACTURING OF THE SAME	US 15/881,242
4	MAGNETIC NANOPARTICLE, HAVING A CURIE TEMPERATURE WHICH IS WITHIN BIOCOMPATIBLE TEMPERATURE RANGE, AND METHOD FOR PREPARING SAME	US 15/702,062