

Industry-Academic Corporation Kyungpook National University

Title (Name of Technology)

Composition for Glucose Sensing Comprising of Nanofibrous Membrane and Method for Manufacturing Non-enzymatic Glucose BlOsensor Using the Same



Executive Summary

Dr. Kwang-Pill, Lee, a professor of Department of Chemistry Education, Kyungpook National University has made intensive studies to find a novel composition for glucose sensing comprising of nanofibrous membrane.

Diabetes mellitus, a metabolic disease caused by deficiency of insulin, displays a higher or lower level of glucose concentration in blood than normal range(80-120mg/dL). Thus, it is important in curing diabetes mellitus to monitor the level of glucose frequently.

Many novel electro-chemical methods, infrared spectroscopies, optical reaction methods have been developed as glucose-analyzing methods. Recent advances in nano technology inspire applying nano materials to chemistry of bioanalysis. To achieve a high efficiency of biosensors, a substrate scattering detected materials should be chosen, and the most desirable substrate is one with large surface, appropriate aperture, high thermostability and chemical inactivity and low expansion rate.

In developing a practical non-enzymetic glucose sensor, electrocatalysts are used. But catalytic oxydation is limited at low or high pH. Present inventors use non-enzymatic glucose sensing material based electrospun nanofibrous in analyzing glucose to show excellent susceptibility.

② Industry Sector: 1. Academic/Research (Biotech) 3. Biotechnology (Na notechnology), 4. Diagnostic (Test systems),8. Non-profit org./Governmen t (universities)

3 Therapeutic Target: 14. Metabolism (Diabetes type I, II)

④ Development phase: early stage

(5) Type of business relationship sought (including licensing availability): development collaboration, or non-exclusive or exclusive licensing agreement

Key Technology Highlights

□ Excellent susceptibility, selectivity and stability

As the compounds of electro radiated PVdF/PAPBA maintain excellent susceptibility, selectivity and stability, they could be used in preparing biosensor efficiently.

□ Providing simple and efficient methods for preparing a biosensor

The method for preparing glucose biosensor of the present invention made an outstanding improvement on conventional PVdF/PAPBA method which is complicated and tangled process.

Excellent reproducibility and commercializability

□ The method of the present invention provide a production process of excellent reproducibility and commercializability and make it possible to prepare more delicate and suitable biosensor due to great susceptibility, selectivity and stability .

□ IP Position

These technologies have been filed for a patent application in a multitude of countries including Korea. The pending patent applications are anticipated to be patented in the near future.

IP Owner Summary

Industry-Academic Corporation Kyungpook National University

TLO in Kyungpook National University

Personal Description of Researcher

- Name
 Kwang-Pill, Lee, Ph.D
- Present Position
 professor
 Advanced analytical chemistry & Nano
 materials Lab
 Department of Chemistry Education
 Industry-Academic Corporation
 Kyungpook National University
- Office address

1370 Sangyeok-dong, Buk-gu, Daegu 702-010 Republic of Korea



Technology Overview

Technology Platform

The core technology of Kyungpook National University is to provide novel composition for glucose sensing comprising of nanofibrous membrane and method for manufacturing non-enzymatic glucose biosensor using the same.

Background and unmet needs: Most common technology for glucose analyzing in blood is enzyme-based method. In spite of impressive development in electro-chemical glucose biosensors, highly stable and reliable glucose-sensing devices had been needed. Enzyme-based glucose sensors have many problems such as instability of enzymes, oxygen-dependency and need of mediators. Furthermore, low or high humidity could be dangerous in using the sensors. Thus, there's a need for non-enzymetic glucose sensing material. Recently, present inventors proved the efficiency of non-enzymatic glucose sensing material based electrospinning nanofibrous. Nanofibrous showed excellent glucose sensing ability. However, method of directly collecting electro-radiated PVdF/PAPBA (poly (vinylidene floride) /poly (aminophenyl boronic acid)) –NFM on ITO has difficulties in controlling thickness and uniformity of the surface.

Discovery and Achievements: For more simple and efficient way of producing non-enzymetic glucose using electro-emitted PVdF/PAPBA-NFM, the present inventors scattered electro-emitted PVdF/PAPBA-NFM in a solvent such as acetone, and plated above solvents to eletrode.

The present technology provides composition for detecting glucose comprising of material to be obtained by scattering electro-emitted PVdF/PAPBA-NFM in the solvent. The solvent may contain further additives.

The composion can be used availably by non-enzymetic glucose biosensor, and prepared by using the PVdF/PAPBA as active material for glucose sensing, which is active material for glucose sensing and verified the effects in the sensibility, alternative and stability in the inventor' study before. More specifically, the PVdF/PAPBA may be contained at the rate of 90-99 wt% to 10-1 wt%. Also, because of using electrospun PVdF/PAPBA and having general caricteristics (for example, have high superficial area) of a nanofibrous membrane prepared by electro-irradiated process, the composition is profitable to application for biosensor.

The present technology provides further a preparation method for a electrospinning nanofibrous membrane, comprising the step of; (i) processing of preparing for nanofibrous membrane by electrospinning a mixture comprising of PVdF/PAPBA; (ii) preparing of composition for detecting glucose by scattering electro-irradiated nanofibrous membrane obtained in step (i) into solusion; and (iii) depositing composition for detecting glucose in step (ii) on a electrode. The step (i) and (ii) are a preparation process of the glucose-detecting composition which can be used directly through dissolved in a available solvent.



Fig. 1. Process of preparing PVdE/PAPBA film glucose sensor electrode.



Fig. 2. Electro irradiated PVdF/PAPBAfilm(a) and UV-spectroscopy of original PAPBA(b).



Fig. 3. Current reaction of PVdF/PAPBAfilm against glucose (inserted graph shows current curve).



Specifically, the step (i) may be prepared with a process of the electrospun nanofibrous membrane preparation, and in the art, by common process irradiating high molecular under low viscosity condition to fibrous formation instantly. In a preparation process of electrospinning solution which has viscosity dissolve in solvent and a process which carry out electrospinning at a emitable distance and a specific voltage, the step (i) can be applied variously as well as adjusted proper to object according to a sort and a concentration of solvent and a distance, a voltage and a method of electrospinning. Both the solvent and additives are the same as the step (ii).

Key Features and Advantages:

(1) Excellent susceptibility, selectivity and stability

As the compounds of electro radiated PVdF/PAPBA maintain excellent susceptibility, selectivity and stability, they could be used in preparing biosensor efficiently.

(2) Providing simple and efficient methods for preparing a biosensor

The method for preparing glucose biosensor of the present invention made an outstanding improvement on conventional PVdF/PAPBA method which is complicated and tangled process.

(3)Excellent reproducibility and commercializability

The method of the present invention provide a production process of excellent reproducibility and commercializability and make it possible to prepare more delicate and suitable biosensor due to great susceptibility, selectivity and stability.

(4) IP Position

These technologies have been filed for a patent application in a multitude of countries including Korea. The pending patent applications are anticipated to be patented in the near future.



Patents and Publications

Kyungpook National University has patents issued or filed for application in many countries including Korea with regrad to composition for glucose sensing comprising of nanofibrous membrane and method for .

TABLE. List of Patents

Country	Appin. No.	Status	Description
Korea	2008-0074282	Pending	Composition for glucose sensing comprising of nanofibrous membrane and method for manufacturing non-enzymatic glucose biosensor using the same
РСТ	PCT/KR2008/006309	-	Composition for glucose sensing comprising of nanofibrous membrane and method for manufacturing non-enzymatic glucose biosensor using the same