TUBERCULOSIS EARLY DIAGNOSTICS BY NANOTECHNOLOGICAL ELECTROCHEMILUMINESCENT SENSOR

Description

The essence of our proposal is **novel photonic sensor** instrument aimed for assay of bioliquids for early tuberculosis (TB) diagnostics. It is based on combination of several main ideas: **electrochemiluminescent (ECL) detection** method; nanotechnological ECL sensor which electrodes are coated with **molecular thin films** doped with reactants **quantum dots,** "tuned" for tuberculosis markers interception with analytical signal emittance.

ECL assay method possesses a) high sensitivity due to optical detection of signal that allows reaching single-photon detection limit, b) high selectivity of the assay due to used quantum dots with different sizes and c) two-channel registration mode, i.e. simultaneous recording of electrochemical and optical ECL signals.

Incorporation of quantum dots (QD) of different dimensions as luminescer – reactants into film deposited onto electrode allows us to determine different TB markers (organic molecules **A** of middle mass) in bioprobes such as blood serum. The **high-technology method** used for thin films formation and deposition onto working electrodes of the proposed sensor is Langmuir-Blodgett one. It allows formation of uniform ordered nanostructured molecular ensembles with highly controllable predefined structure from semiconductor QD.

The proposed sensor is aimed at detection of certain TB mycobacterium organic markers in bioliquids (blood serum) important for early recognition of tuberculosis.

Innovative Aspect and Main Advantages

Innovative aspect:

Proteolysis activation result in accumulation of a considerable quantity of products of protein degradation. Some of mentioned substances are unique and can be used as markers of any tuberculosis forms, irrespective of its strain and genetic typing. The sensor's analytical signal is free from background noise caused by false interaction due to peculiarities of ECL detecting method. The full control over the assay procedure allows introducing automation of diagnostics process in mass researches, including flow analysis principle.

Main advantages:

- utilization of novel nanotechnology in combination with electrochemiluminescent detection method;
- early tuberculosis diagnostics;
- diagnostics of any tuberculosis active and latent forms;
- fast and simple assay procedure;
- simple sample preparation (~ 1-2 minutes, requires only one person);
- low sample volume (~20 μl);
- low assay cost.

Areas of Application

- Medicine,
- food industry,
- pharmacology,
- ecology.

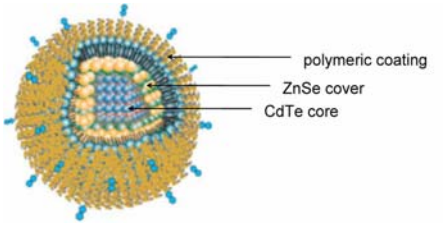

Fig. 1. Structure of semiconductor quantum dot

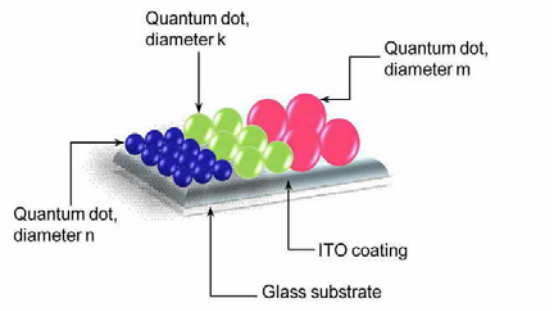

Fig. 2. ECL sensor work electrode: sketch

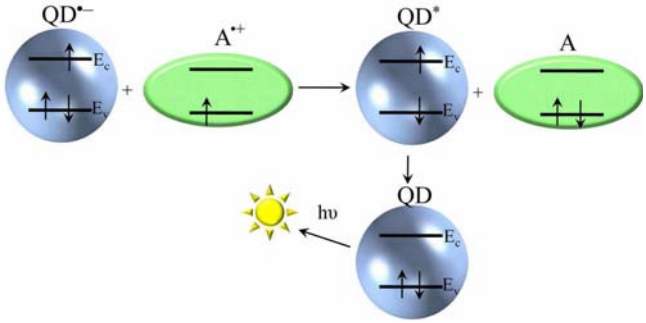

Fig.3. Stage of ECL detection in tuberculosis diagnostic

Fig.4. ECL sensor instrument with accessories for assay accomplishment (photography)

Stage of Development

Development phase – technology and sample laboratory tested.

Contact Details

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