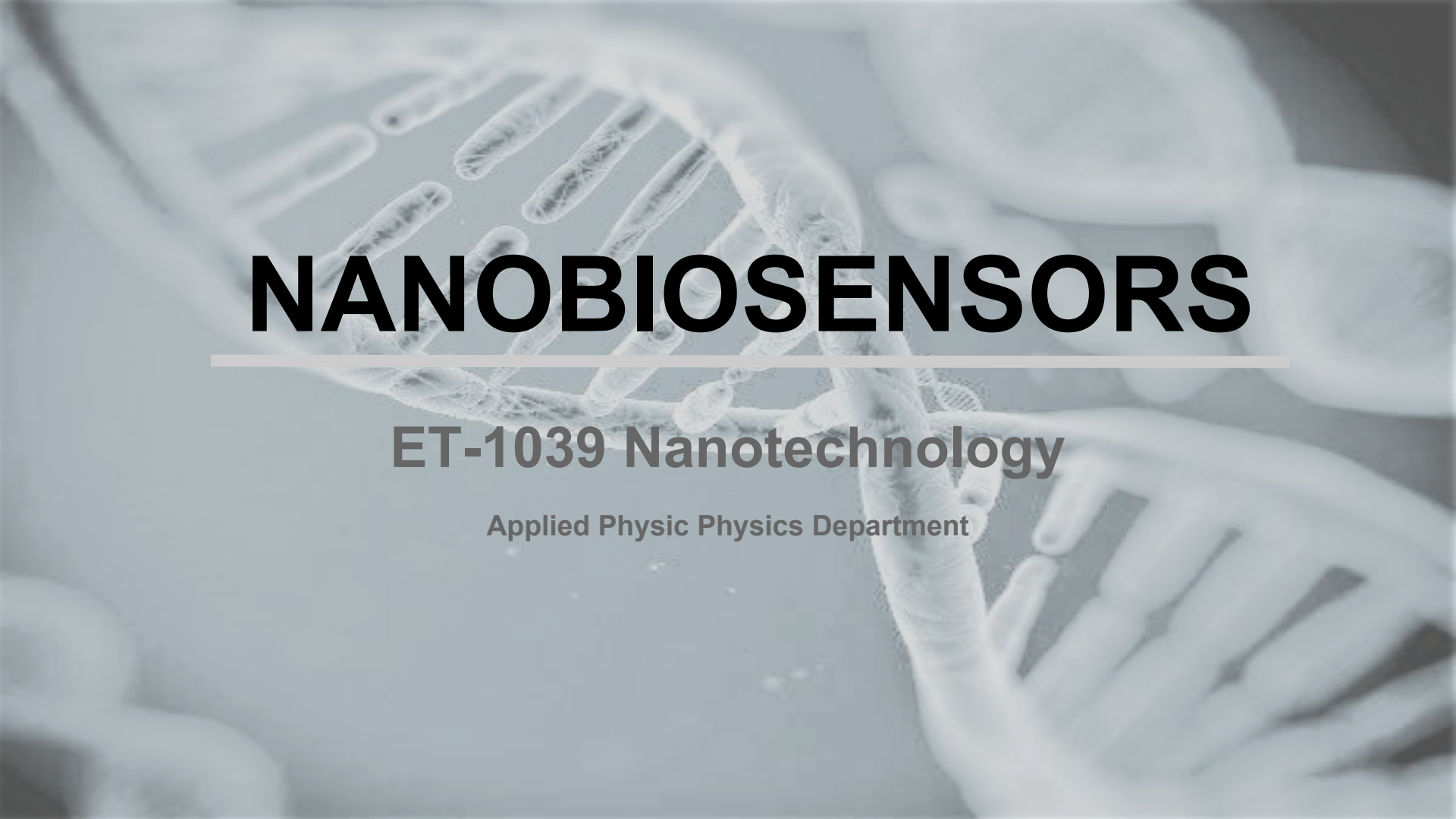

NANOBIOSENSORS

ET-1039 Nanotechnology

Applied Physic Physics Department

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2. FIELDS APPLICATIONS

HISTORY

BIOSENSORS

- 1956 Leland C.Clarck Jr. finished his work with the O2 electrode, but he did not conform and with the idea of extending.
- Currently there are many biosensors in which the wide variety of biological components that are combined with the different types of transducers.

NANOTECHNOLOGY

- Nanotechnology that it has its beginning in the speech that Richard Feynman gave at the University of Caltech (California) on 1960s. Actually it was started to be studied in the 1980s.
- Nowadays more than 3000 products are obtained from nanotechnology

HISTORY

NANOBIOSENSORS

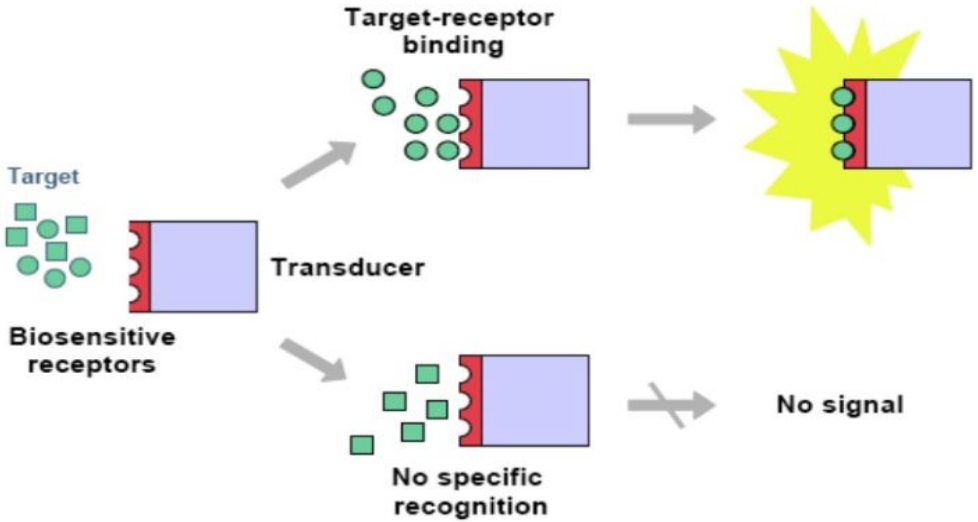
- It is expected that in the future the nanobiosensors have some of this characteristics:
  - Robust
  - Cheap
  - Multianalyte possibility
  - Detection at peak / femtomolar levels or even at the level of a single molecule
  - Fast and direct
  - Portable
  - Easy to use by non-specialized personnel
  - Regenerable or sufficiently cheap to be of a single use

BIOSENSOR

- A Biosensor is an instrument for the measurement, identification and transformation of biological events

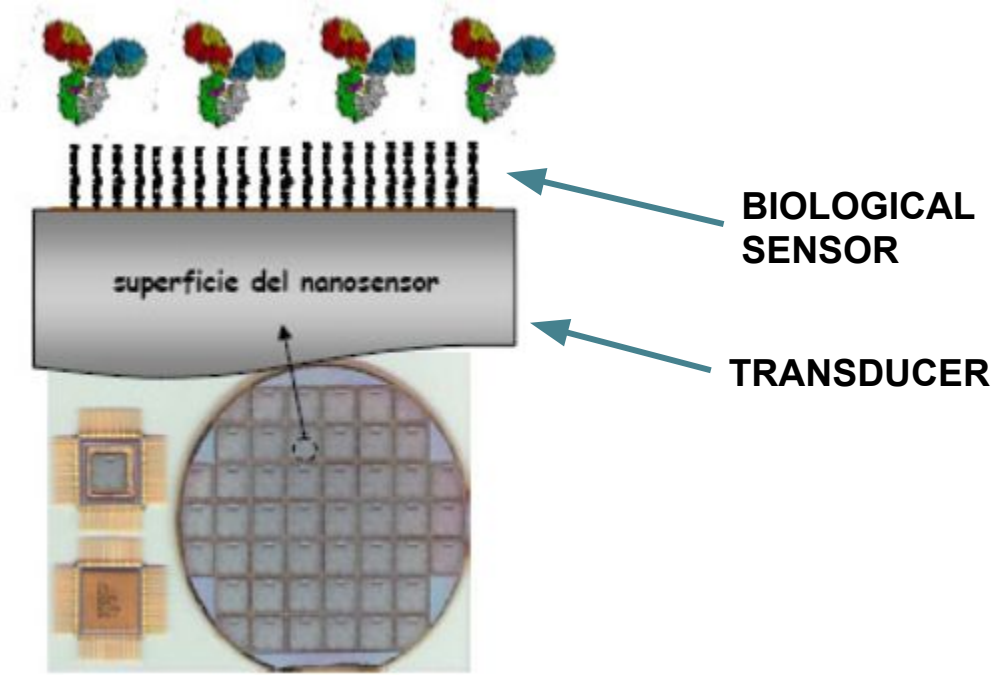
- Parts:
  - The biological sensor:
    it can be a tissue of microorganisms, enzymes, antibodies, nucleic acid chains, etc.

  - The transducer:
    it couples the other element and translates the signal emitted by the sensor.



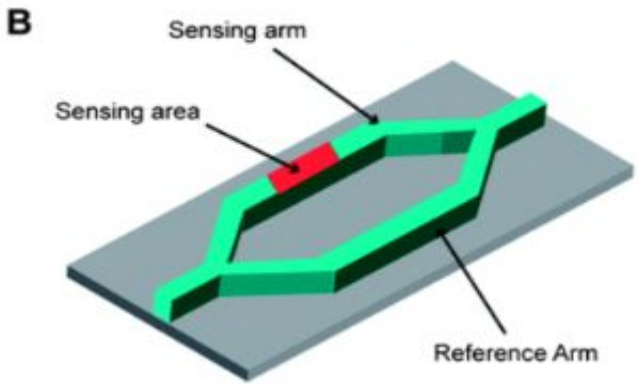
NANOBIOSENSOR

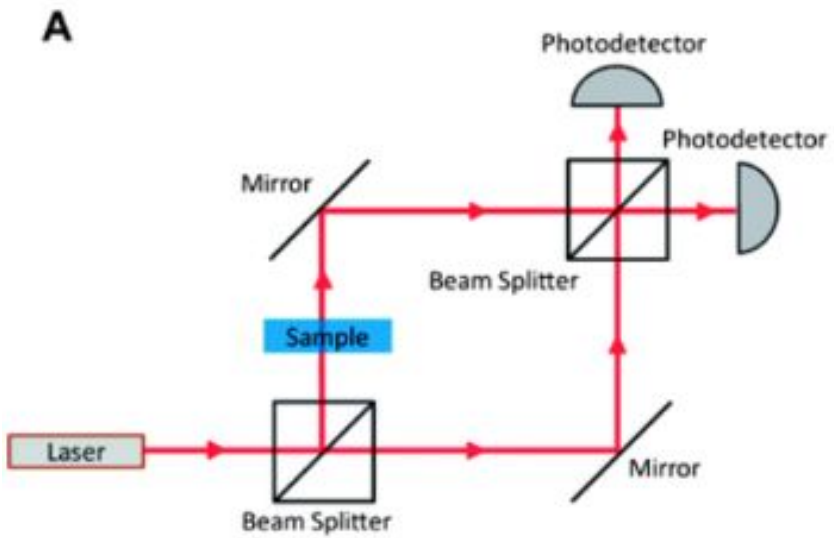
- A nanobiosensor is a fusion of nanotechnology with biosensors
- Sensors that they are made up of nanomaterials
- The sensibility of nanobiosensors it’s greater than biosensors



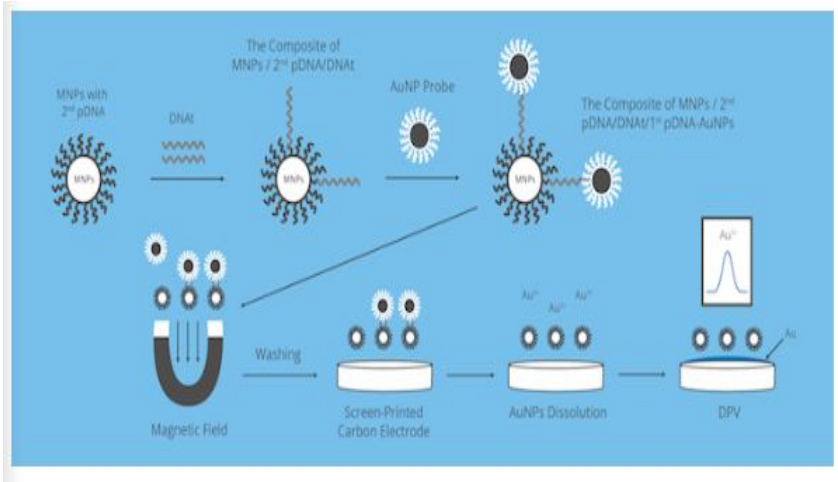
PHOTONIC NANOBIOSENSORS

- One of the most common formats for on-chip interferometric sensing is an integrated Mach–Zehnder interferometer (MZI).
- Illustration B- on-chip Mach–Zehnder interferometer with a Y-junction splitting a waveguide into a sensing arm and a reference arm.



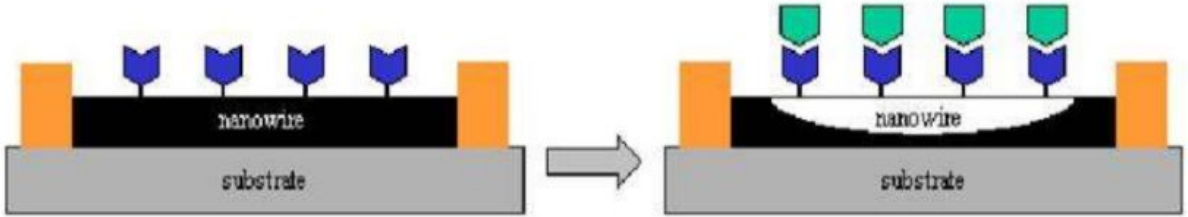


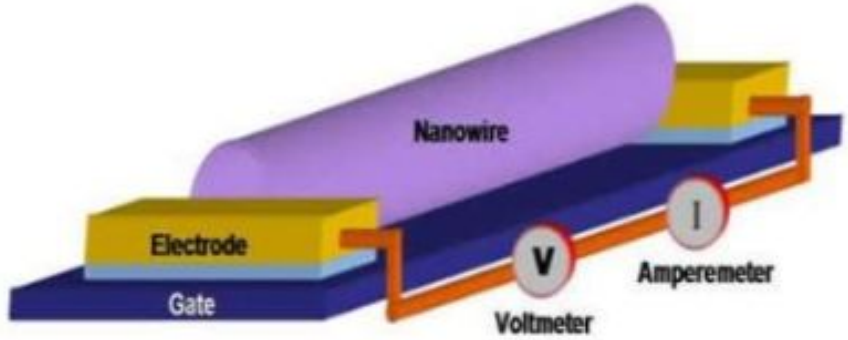
NANOBIOSENSORS BASED ON NANOPARTICLES



- The DNA-based biosensor system can detect specific genomic DNA targets.
- They are extracted from bacterial samples or contaminated food matrices.
- This extraction is carried out using magnetic nanoparticles to isolate and pull out the pathogenic DNA targets.
- It can detect fresh, directly extracted DNA.

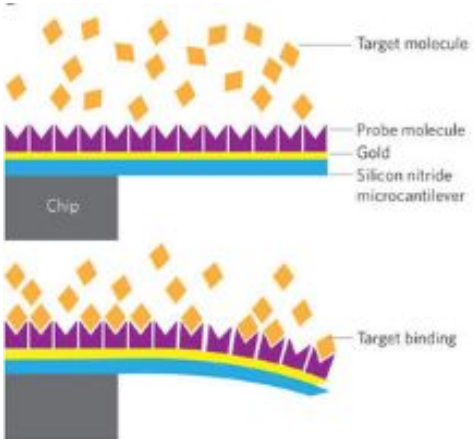
NANOSENSORS FET





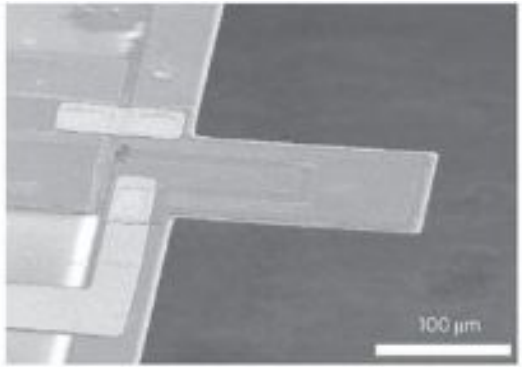
- Fabricated using nanomaterials such carbon nanotubes, metal oxide or Si nanowires.
- Extremely sensitive to environment

NANOMECHANICS BIOSENSORS



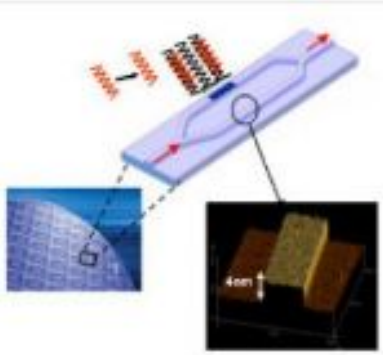
- Well matched in size with molecular interactions.
- Provide a basis for biological probes with single-molecule sensitivity.

- With a particular focus on fast mechanical biosensing in fluid by mass- and force-based methods and the challenges presented by non-specific interactions.



BIOMEDICAL AND DIAGNOSTIC APPLICATIONS

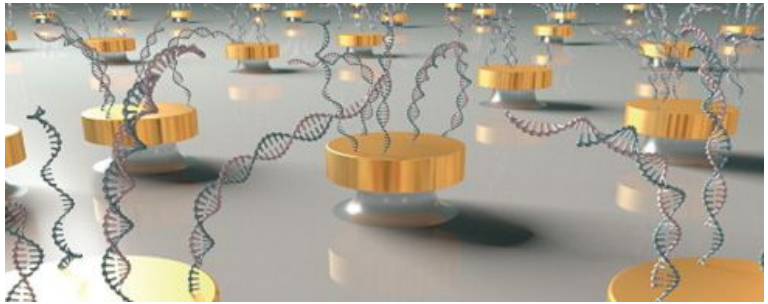
- Nanophotonic biosensors



- It has an extreme level of sensitivity for the direct detection of proteins and DNA.
- With these nanobiosensors open the possibility of identifying pathological changes within an individual cell and also increase the knowledge about cellular functions in vivo.

BIOMEDICAL AND DIAGNOSTIC APPLICATIONS

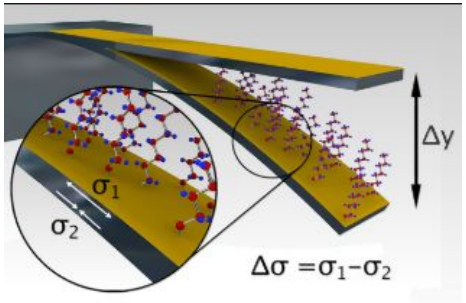
- Nanoplasmonic biosensors



- The nanosensors allow direct detection of concentrations in the nanomolar range directly and without the need for fluorescent markers.
- Detection of proteins at the nanomolar level has been achieved without the need to penetrate them or point mutations in the DNA chains.

BIOMEDICAL AND DIAGNOSTIC APPLICATIONS

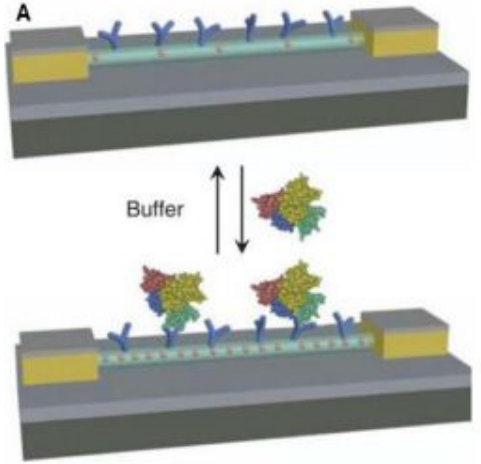
- Nanomechanical biosensors



- It is manufactured with microelectronic technology which allows the production in more at low cost.
- Thanks to this biosensors, vaccines could be prepared, mutations indicative of disease identified or drugs identified.

ENVIRONMENTAL APPLICATIONS

- Nanowire biosensing



- These nanobiosensors can be used to find the particular type of harmful measure of a material present or prevailing in the environment.
- These nanosensors are a good candidate material for manufacturing controlled nanobiosensors remotely for environmental monitoring.

APPLICATIONS IN THE INDUSTRY

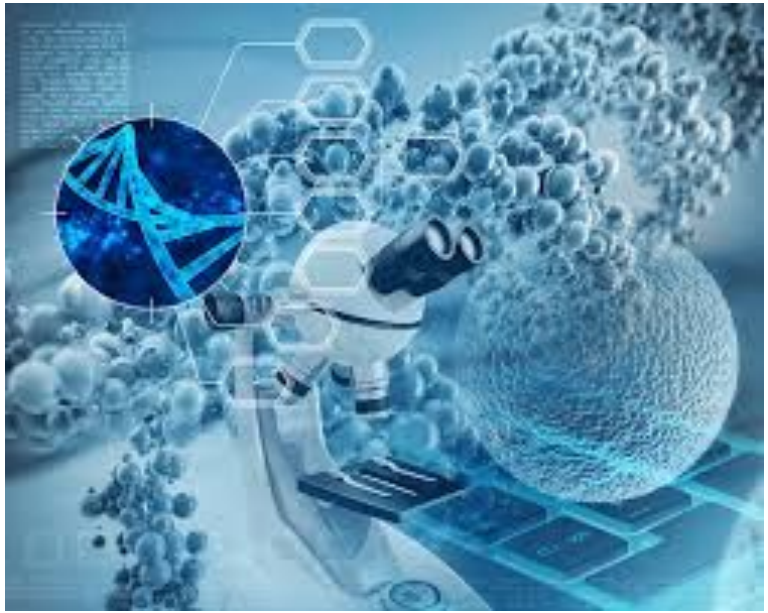
- The use of nanobiosensors can be regulated in industrial operations, such as the feeding of bioreactors for various applications.
- They are also used in the agri-food industry to analyze food and to detect and neutralize microorganisms and pathogens.

DIVERSE APPLICATIONS

- There are many other applications for these nanobiosensors. For example, a French research group has managed to create nanobiosensors capable of detecting a smell of quantities and imperceptible to humans.
- Therefore, they could be spent both for quality control and for food safety, as well as for the detection of explosives or drugs.

NANOMEDICINE

- Introduction
- Interactions at the nanoscale
- Nanorobots
- Personalized precocious treatment



Main areas of nanomedicine

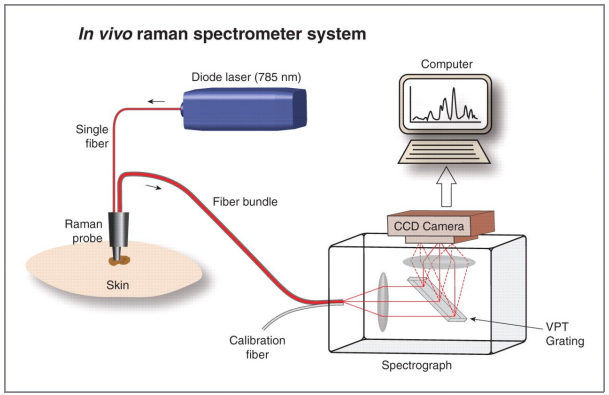
- Nanodiagnosis
- Nanotherapy
- Medicine regenerative

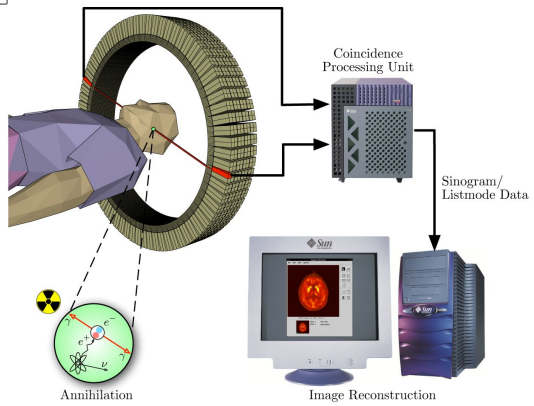
NANODIAGNOSIS

Two kinds:

- In vivo

- In vitro





THANK YOU FOR YOUR ATTENTION

DO YOU HAVE ANY QUESTIONS?