

Department of Physics (DF)

## Functional Layer-By-Layer Films

DF/CEFITEC/Functional Molecular Systems Group



**Paulo A. Ribeiro**

- PhD degree in Materials Sciences and Engineering (1999)
- Graduation in Physics and Materials Science Engineering (1989)

## Objectives

Study of the formation and characterization of functional supra-molecular film structures as a result from the assembly of organic molecules, for the creation of Molecular Electronics, Optics and Photonics and of sensor devices.

- Preparation of molecular films from adsorption from solution
- Achievement of hetero-structures having one or more functionalities:
  - Electrical or magnetic feature
  - Optical feature
  - Chemical feature
- Optimization of film preparation conditions towards featured molecular structures

## Methodology

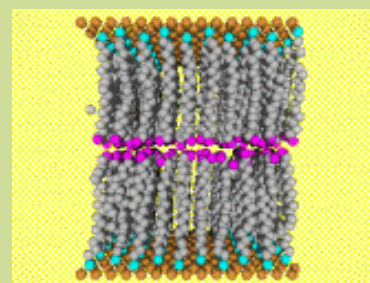
Assemble of organic molecules layers onto solid supports, via alternate adsorption from solution adsorption of oppositely charged molecules - The Layer-By-Layer Technique (LBL).

- Preparation of film through the LBL Technique
- Study of main adsorption parameters:
  - Adsorption Time
  - Support type
  - Film Preparation Procedure
  - Adsorption Temperature
  - pH and Ionic Strength

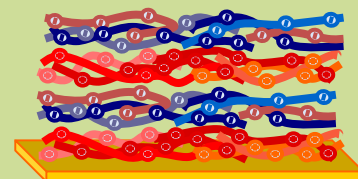
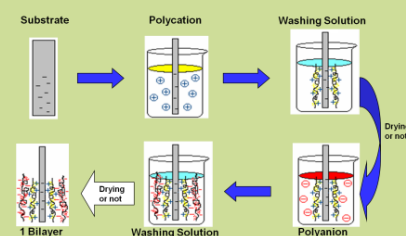
## Expected Results

- **Characterization and optimization of functional properties:**
  - Birefringence
  - Magnetization
  - Optical relief gratings and programmable optical lenses
  - Electrical conductivity and impedance
  - Chemical sensing capabilities
- **Development and optimization of devices**
  - Optical storage devices and programmable lenses
  - Sensor devices (chemical pollutants, electronic Tongue and nose)

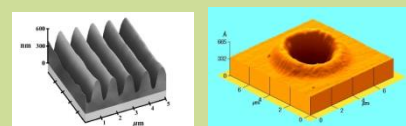
## •Functional molecular structures



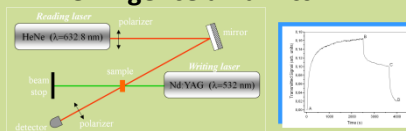
## •The Layer-by-layer Technique



## •Surface Relief gratings



## •Birefringence dynamics



## •Sensor Systems

