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Rapid detection of pesticides via surface plasmon resonance (SPR) method

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Plasmonic & Biosensors Group

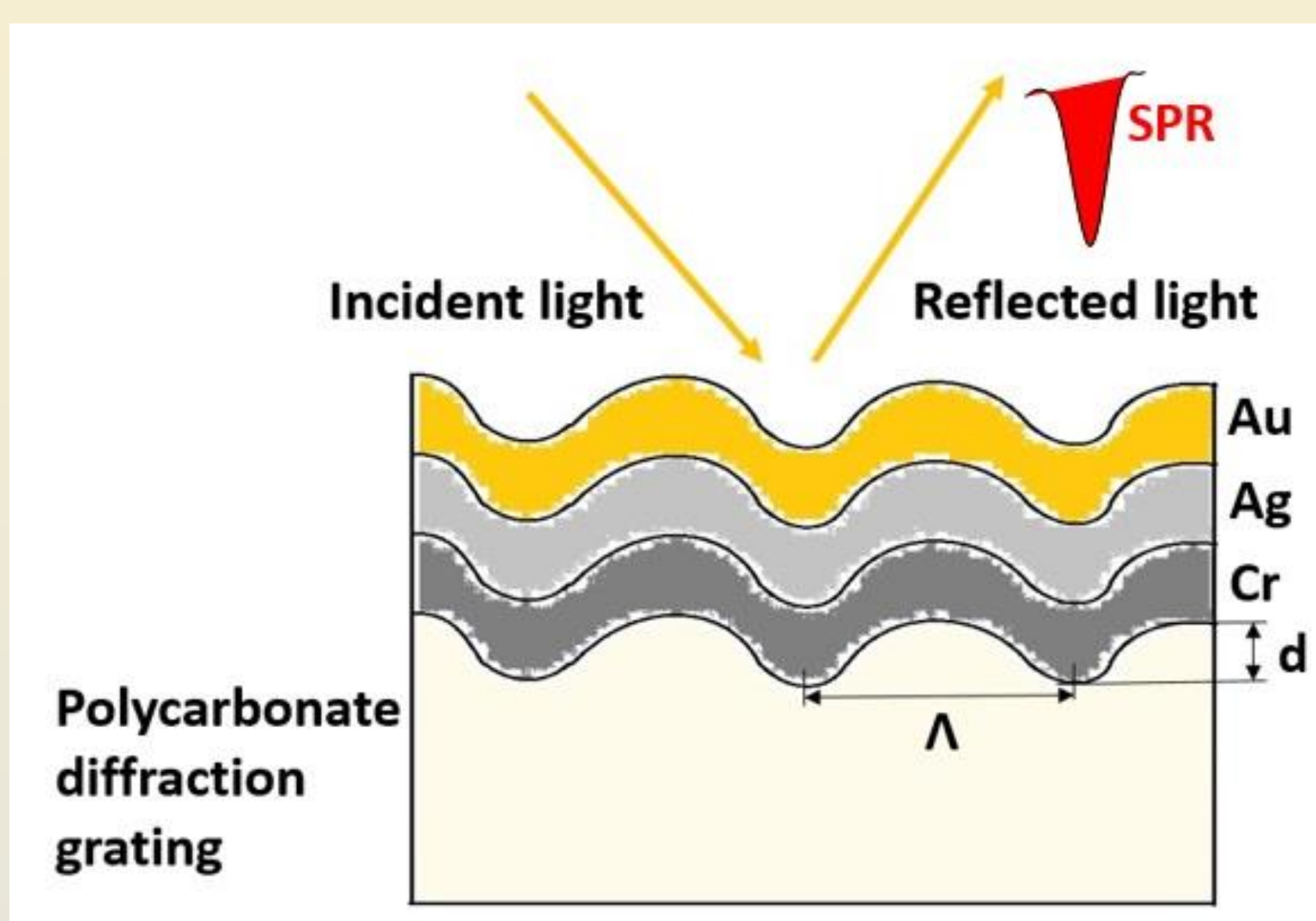
<https://www.biosensors-bg.com/>

Abstract

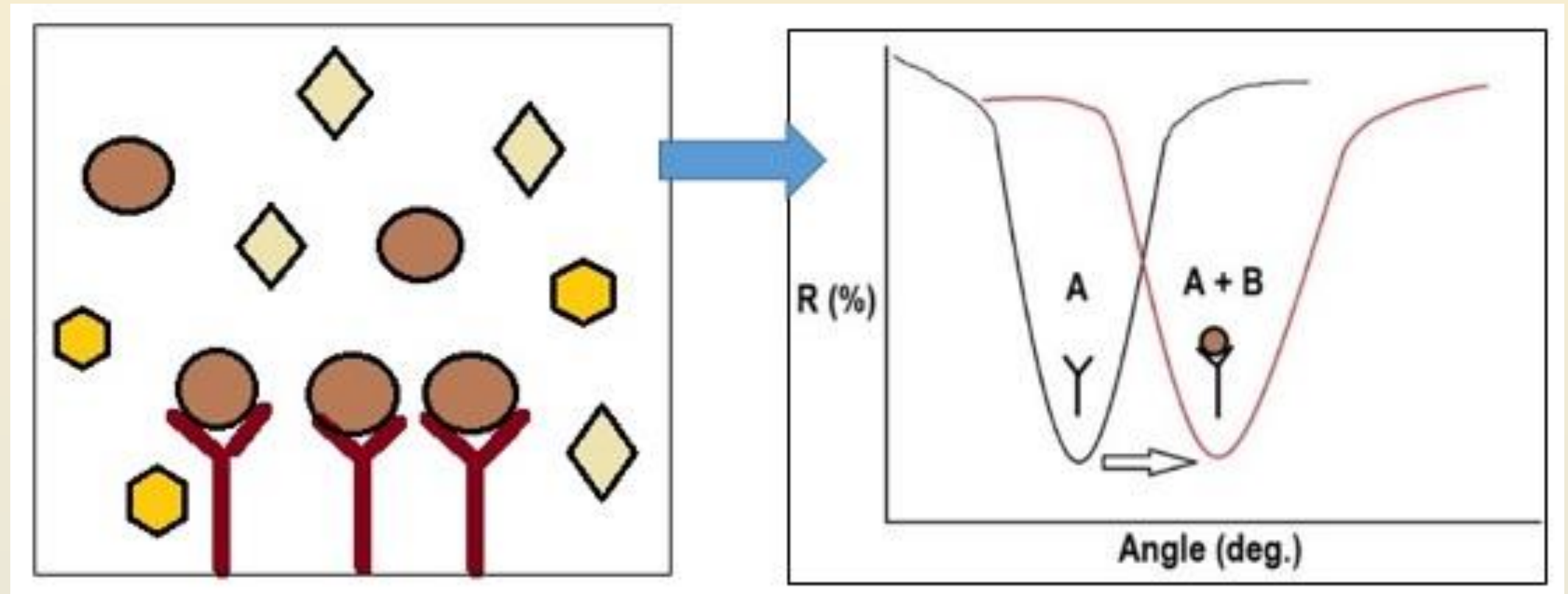
The misuse of synthetic pesticides and the control of their use is a global challenge. The developed methods for the detection of pesticides (Gas and liquid chromatography in combination with other methods) are expensive, time-consuming and require the transportation of large quantities of food samples to a laboratory. This determines the need for a reliable technology for qualitative and quantitative detection of pesticides, which can be implemented quickly and on site.

In the present work, an innovative biosensor-based pesticide detection method is presented. This method allows for rapid detection of various pesticides, with accuracy and sensitivity guaranteeing reliability. The method is applicable for field tests.

Surface Plasmon Resonance (SPR)



SPR biosensors are based on the change in the optical characteristics of the sensing layer, caused by the binding of the analyte to the ligand attached to the metal surface.



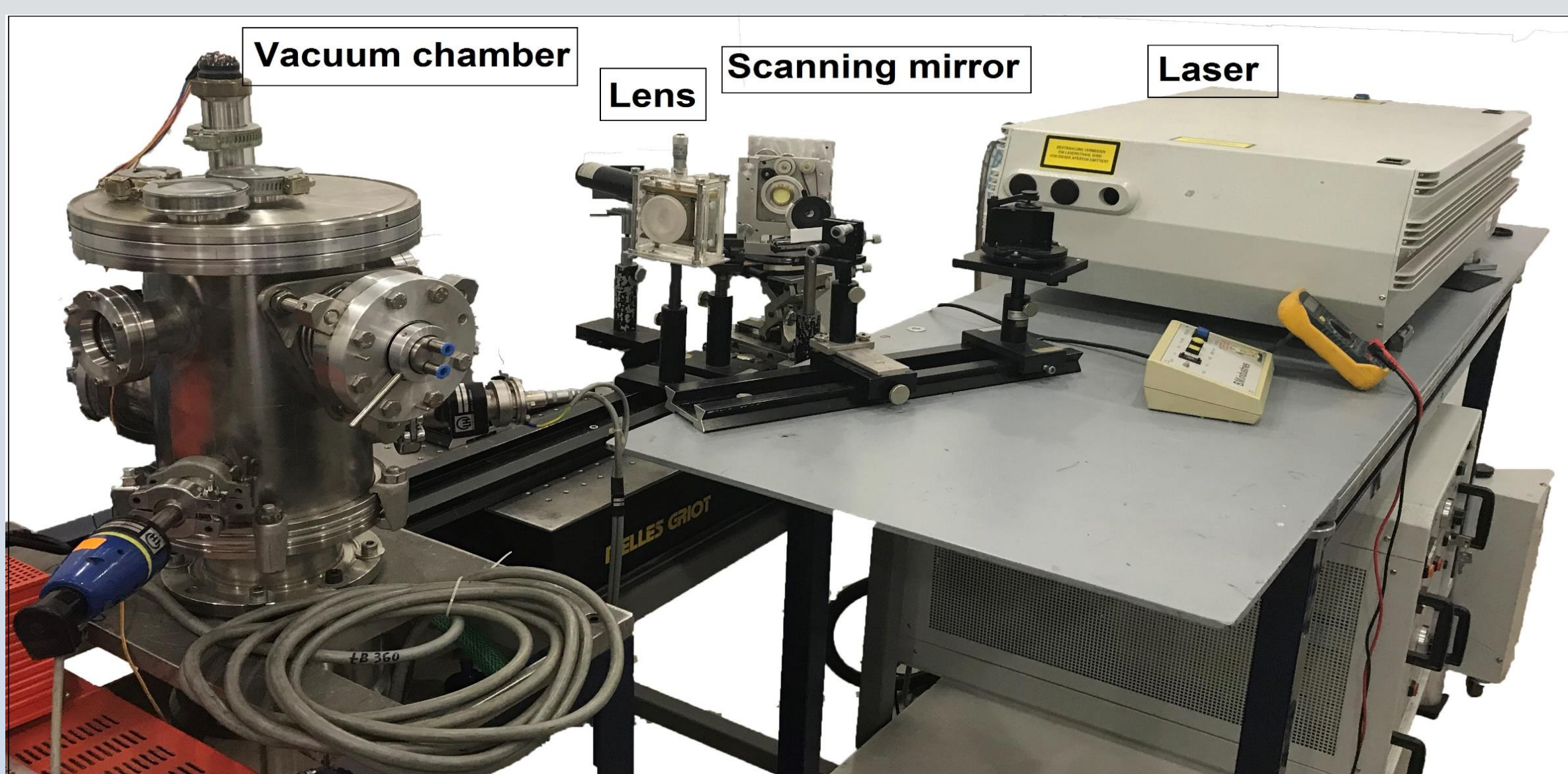
Advantages

- High sensitivity
- Possibility for quantitative analysis
- Tracking dynamic interactions
- Real time monitoring
- Label-free detection
- On site detection

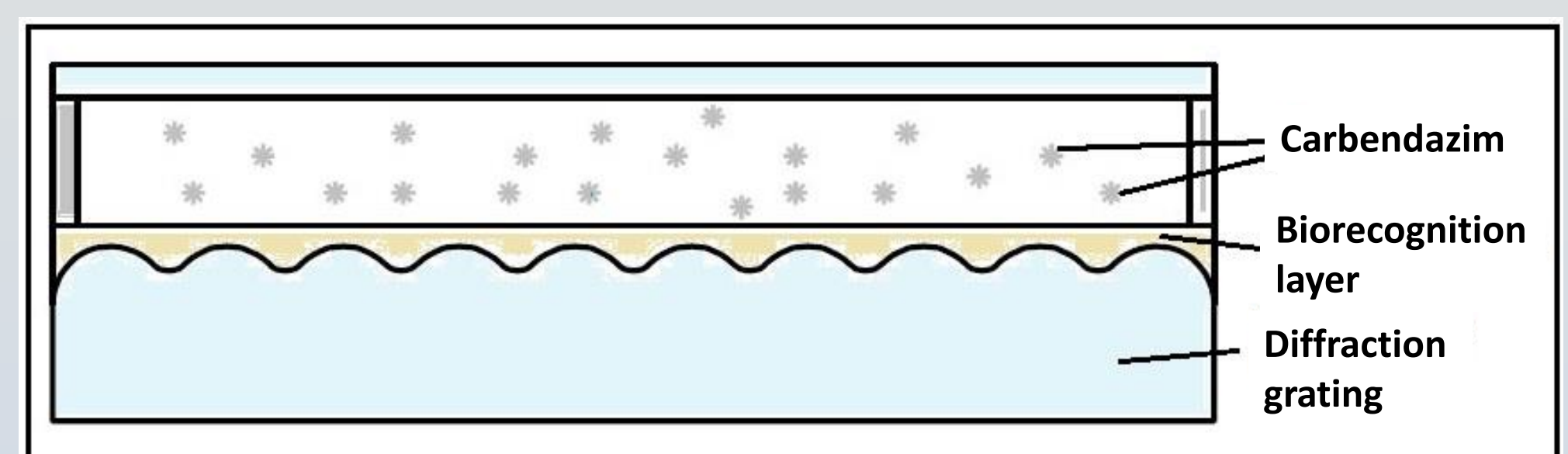
The goal of our research group in the next months is developing a biosensor technology based on surface plasmon resonance (SPR), which allows rapid, qualitative and quantitative detection of the pesticides Carbendazim (CBZ) and Cypermethrin (CP) in situ. For this purpose, we will optimize our methods for detection (SPR in a diffraction grating) and for deposition (MAPLE) of thin biologically active layers. This will solve the problem of detection of low molecular weight substances such as CBZ (191 Da) and CP (416 Da).

As a result, a device will be created for the qualitative and quantitative detection of CBZ and CP in situ.

MAPLE - Matrix assisted pulsed laser evaporation



Flow cell



Rich experience in the development of SPR-biosensors:

- ✓ rapid detection and monitoring of hydrogen (H₂)
- ✓ detection of glucose by glycated hemoglobin
- ✓ detection of Helicobacter Pylori in saliva
- ✓ detection of SARS COV2 and Covid 19

The target (ligand) is dissolved in a solution of volatile matrix and frozen. The deposition occurs in a vacuum chamber under the irradiation of UV light.

Keywords: Optical chip, Pesticide, Fungicide, Carbendazim, Cypermethrin