Biosenseurs spécifiques par spectroscopie infrarouge
A. Petit, E. Gosselin, and J. De Coninck Laboratory of Physics of Surfaces and Interfaces

Introduction – FTIR/ATR

Advantage ATR:
1. Enhance the quality of signal
2. Increase the energy
3. Short acquisition time

Functionalization and grafting surface

Results & discussion

Verrucarin A in urine

Verrucarin A is a toxic trichothecene mycotoxin that can be produced indoors at very low level by moulds contaminating dwellings and may be associated with several human health problems (neurological problems and in some cases death)

Verrucarin-A reference spectrum

However, plotting the peak areas observed during the binding of the target as function of the VerA concentration gave a linear relationship using a semi-logarithmic scale for three series of experiments. Clearly the binding of the VerA was dependent upon the quantity of receptors present at the sensor surface. Therefore, the observed peak area obtained in the CH2,3 stretching vibration, corresponding to the amount of the VerA bound to the sensor, needed to be normalized. We choose to normalize using the quantity of mAb bound to the sensor surface determined by evaluating the peak area of the amide bands (NH2) of each track after the grafting step.

Conclusion

- A very high sensitivity (reaching pg/ml for Verrucarin-A quantified in environmental samples)
- Robustness:
  - High recovery values
  - Reproducibility (run to run recovery)
- Offers chemical signature
- Precision (replicates at the same conc. within run thanks to normalization)

Reference

- Quantification of the trichothecene Verrucarin-A in environmental samples using an antibody-based spectroscopic biosensor. E.Gosselin & al.
- Fourier transform infrared immunosensors for model hapten molecules. E. Gosselin & Al.

French resume

Nous sommes parvenus stade à établir une nouvelle méthode de détection de molécules biologiques basée sur des techniques IR de surface. Cette nouvelle technique est originale à plus d’un titre puisqu’elle permet non seulement de mettre en évidence: l’interaction « récepteur / ligand » en temps réel mais elle fournit aussi des informations structurales caractérisant de manière univoque les molécules intervenantes à partir des spectres FTIR-ATR.