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## Bloch Surface Waves Based Biosensor Using a Ternary Photonic Crystal

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### ABSTRACT

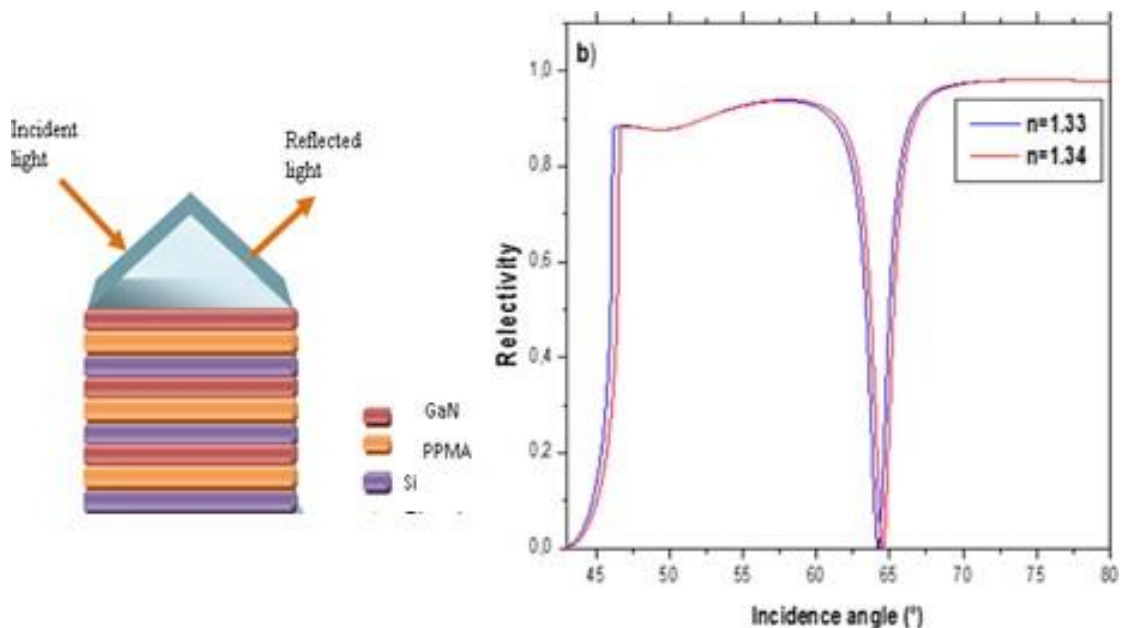
We proposed a ternary photonic crystal (TPC) sustaining Bloch Surface Waves (BSWs) for biosensing. The photonic structure is three alterations of GaN/PPMA/Si. We use the Kretschmann coupling technique and p polarized incident light for Bloch surface wave excitation. The biosensor performance is simulated using the transfer matrix method (TMM).

### Introduction

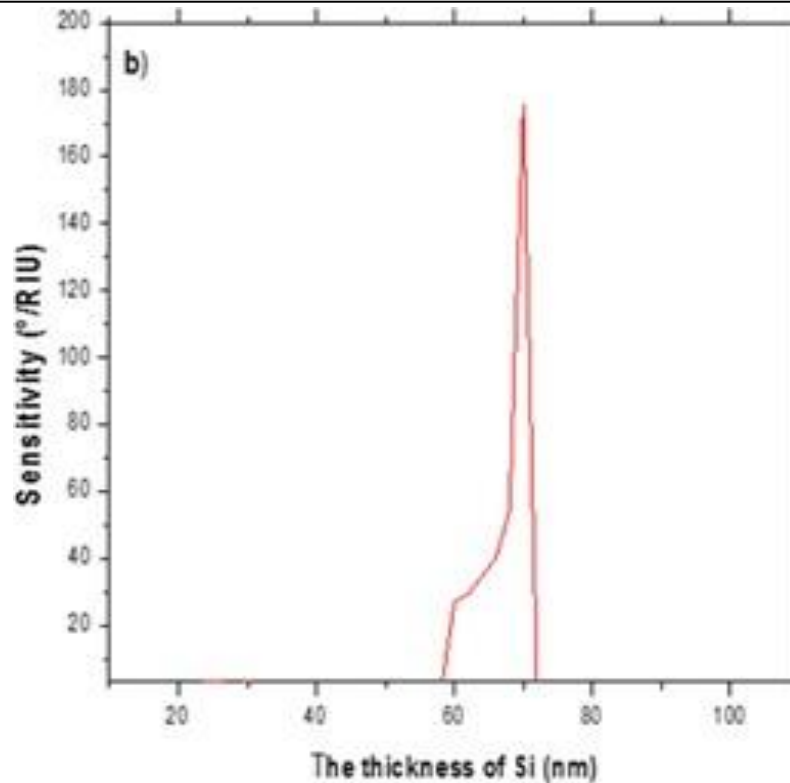
Bloch surface waves (BSW) are evanescent electromagnetic waves propagating on the surface of a truncated periodic one-dimensional dielectric photonic crystal (PC) [1].

### Experimental/Theoretical Study

For a wavelength used is  $\lambda = 633 \text{ nm}$ , the refractive indices of the prism as well as the GaN and PMMA layers are respectively  $n_p = 1.8449$ ,  $n_H = 2.38475$  and  $n_L = 1.4887$ . The thicknesses of the layers are respectively  $d_H = 66 \text{ nm}$  and  $d_L = 106 \text{ nm}$



**Figure 1:** Angular reflectance as a function of the refractive index of the medium to be detected 1.33 (water) and 1.34.  $d_{Si} = 62 \text{ nm}$



**Figure 3:** the variation of the sensitivity to different thicknesses of the Si layer of the structure ternary

The Ternary ePC-based biosensor are shown in Fig.1. P-polarized incident light and prism coupling in the Kretschmann configuration are used for the structure. The comparison of the performance of biosensors is carried out by the transfer matrix method (TMM) [2]

### Results and Discussion

Comparison of the sensitivity of the bio detector according to the thickness of the silicon layer Si

### Conclusion

Optimization of the thickness of the Si layer makes it possible to control the sensitivity of the biodetector

### References

- [1] P. Yeh, A. Yariv, A.Y. Cho, Optical surface waves in periodic layered media, *Appl. Phys. Lett* 32 (1978) 104
- [2] X. Li, K. Xie and H. Jiang, Properties of defect modes in one –dimensional photonic crystal, *Proc. SPIE, Advanced Sensor Systems and Applications*, 7853 (2010).