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CHARACTERIZATION OF HYDROGENATED AMORPHOUS SILICON CARBIDE PLATFORMS BY VIBRATIONAL SPECTROSCOPY TO DEVELOP AN OPTICAL BIOSENSOR FOR FUTURE APPLICATION IN DETECTING DIFFERENT ANALYTES.

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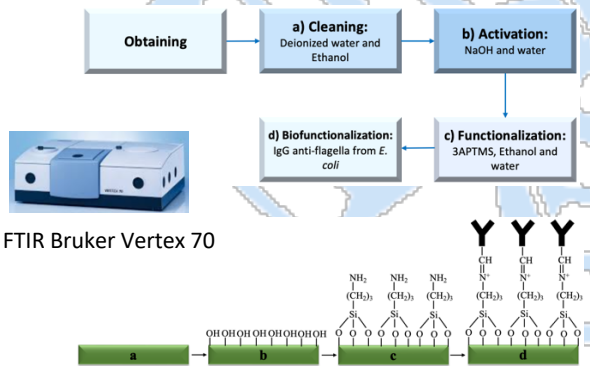
Introduction. Nowadays, biosensors are becoming a more studied subject, since they are devices that determine certain analytes in short times and commonly their detection methodology is easy to carry out. Recently, hydrogenated amorphous silicon carbide (*a*-SiC:H) surfaces are gaining importance to elaborate biosensors, thanks to their properties: chemical resistance, mechanical robustness, and biocompatibility [1].
In this study self-assembly monolayers (SAM) methodology was used to develop optical biosensors on *a*-SiC:H platforms. Antibodies against flagella from *E. coli* were employed as biological recognition element and Fourier transform infrared (FTIR) spectroscopy was used as transducer.

Methodology. General methodology is represented in figure 1, all steps were made on *a*-SiC:H platforms:



FTIR Bruker Vertex 70

Figure 1. SAM methodology schematic representation, all steps were analyzed by FTIR spectroscopy.

Results. Different characteristic functional groups, obtained and generated during SAM methodology, were identified at the FTIR spectra (Figure 2): Si-Si (616 cm^{-1}), Si-O-SI (1100 cm^{-1}), Si-C (775 cm^{-1}), NH_2 (1520 cm^{-1}), C=O (1710 cm^{-1}), Amide I (1654 cm^{-1}) and Amide II (1545 cm^{-1}) [2][3], which helped to link the antibodies on each surface.

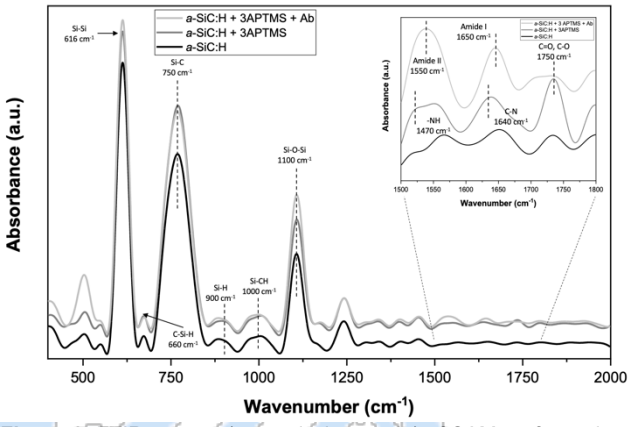


Figure 2. FTIR spectra (transmission mode) of SAM performed on *a*-SiC:H platforms.

Conclusions. With these results, it is confirmed that *a*-SiC:H biosensors could be applied in detecting different kind of analytes such as bacteria, protein, DNA, RNA, and cells in food, water, clinical, and environmental samples; increasing the variety of tests used to determine or detect important analytes for humans.

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Bibliografía.

[1] Morales J, Herrera J, Saldana Z, Reyes C, Gómez F, Orduña A. (2020). *Surf Interfaces*. 20:100550.
[2] Paluszkiewicz C, Piergies N, Chaniecki P, Rekas M, Miszczyk J, Kwiatek W. (2017). *J Pharm Biomed Anal*. 139:125-132.
[3] Marka S, Peruswamula V, Valadi V. (2020). *Nanocarbon Electrochemistry*. 3:85-121.