PRESENTER INFORMATION

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Fernando started is bachelor back in 2012, in Biotechnology, followed by 2 years of Masters in environmental and industrial biotechnology. Both his investigation courses (bachelor and masters) were about the production of biopolymers through bacteria. He then spent 3 years doing research about piezoelectrics, namely barium titanate and bismuth ferrite and attempting to reduce crystallization temperatures, both by chemically changing sol-gels and by trying alternative annealing procedures. Currently, Fernando is in 3rd year of PhD, working with composites, trying to develop flexible piezoresponsive sensors. Part of this work was developed in a partnership with the ICMAB institute, in Barcelona, where Fernando spent 2 months funded by NETPORE, trying to develop these composites.

Piezoresponsive behavior of bacterial nanocellulose doped with zinc oxide nanoparticles

In the current IoT landscape, sustainable approaches to constructing and powering sensors are essential. Traditional rigid designs are evolving to meet demands for greater flexibility and versatility. Piezoelectricity, the ability of certain materials to convert mechanical energy into electrical energy, offers a solution. Incorporating this property into sensors can significantly extend battery life and enable autonomous functionality through energy conversion. While lead-based piezoelectrics pose health and environmental concerns, eco-friendly alternatives like barium titanate (BT) and zinc oxide (ZnO) exist. A promising strategy involves a nanocomposite approach, embedding a crystalline piezoelectric within a polymeric or biopolymeric matrix.

My research focuses on growing ZnO piezoelectric nanoparticles in solid bacterial nano cellulose films. Using XRD, SEM, and TEM, I characterize particle properties and film characteristics. A prototype piezoelectric nanosensor/nanogenerator was constructed and tested for sensitivity using a piezoelectric shaker.