The description for the General Public

Imagine a future where detecting diseases or environmental toxins is as quick and precise as taking a digital snapshot. That is the vision behind our exciting research project, MXNANO. We are on a mission to transform how we detect and diagnose health conditions and monitor our environment using a cutting-edge material called MXene.

MXene, a marvel of modern science, is incredibly thin yet mighty in its ability to conduct electricity and interact with biological molecules. We combine MXene with other smart materials to create super-sensitive sensors that pick up on the smallest signals from harmful toxins or disease markers, even in complex mixtures like blood or water.

The **project aims** to develop advanced MXene-based nanocomposites for *multiplex* and *multimodal* biosensing platforms. This **research aims** to leverage the unique properties of MXene-based nanocomposites, such as MXene/polypyrrole (Ppy), MXene/polydopamine (PDA), and MXene/gold nanoparticles (AuNPs), to create advanced biosensors for health diagnostics and environmental monitoring. These platforms are designed to enhance the sensitivity and selectivity of biosensors for health and environmental applications, enabling the accurate detection of a wide range of biomolecules, pathogens, and toxins in various complex matrices. As model target analytes, two types of objects will be used: viruses (SARC-Covid) and mycotoxins (AFB1, OTA). This project seeks to overcome current limitations in biosensing technology and pave the way for diagnostics, environmental monitoring, and personalized healthcare innovations.

The outcomes of this project have the potential to revolutionize the field of electrochemical biosensing. The development of MXene-based hybrid nanocomposites as a versatile platform for biosensing could pave the way for cost-effective, rapid, and highly sensitive detection of a wide range of analytes. The project's insights into the interactions between MXenes and conductive polymers could lead to new strategies for engineering sensor materials with tailored properties. The project's findings are expected to drive advancements not only within the field of biosensors but also in materials science and nanotechnology, creating a ripple effect across various scientific disciplines.