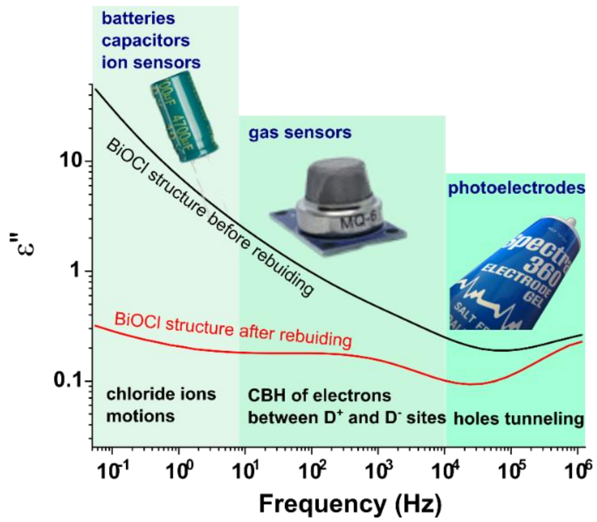
Layered oxyhalides constitute a widely studied group of materials due to their optical and electrical properties and the possibility of ferroelectricity occurring. One of the most studied is bismuth oxychloride (BiOCl), the structure of which is composed of positively charged $[Bi_2O_2]^{2+}$ layers separated by a layer of chlorine ions. Interestingly, these ions can be successfully replaced with other anions such as bromine and iodide. Additionally, it is possible to dope the $[Bi_2O_2]^{2+}$ layer with other cations, such as Pb^{2+} or Sr^{2+}. **However, according to our knowledge, there is a lack of articles related to the synthesis of high-entropy oxyhalides containing an equiatomic concentration of cations and anions and dielectric studies of these compounds (also conventional ones).**

Due to the layered structure, oxyhalides are tested for possible applications as catalysts, electrodes for chloride batteries, capacitors, and sensors for gases and ions. Despite these materials' wide range of application possibilities, there is currently a lack of information on their dielectric and electrical properties in a wide range of frequencies and temperatures. The literature indeed provides information on the modelling of these properties and high-frequency properties (in terms of UV light); however, the mechanisms of ions transport and electrical processes taking place in these materials are still poorly understood. For example, BiOCl has been tested so far as a gas sensor at 100 kHz, but the exact mechanism responsible for the changes in conductivity in this material is unknown. This is because the charge carriers' movements depend on the frequency and differ for different frequency ranges.

Therefore, to obtain comprehensive information on the dielectric properties of layered oxyhalides, research on the synthesis of materials with high purity, controlled morphology, and structure will be performed. Measurements of dielectric and electrical properties as a function of frequency and temperature and the measurement of structural and dielectric changes generated by the UV irradiation will provide comprehensive information about the charge carriers' movements in layered oxyhalides. It has now been confirmed that these changes occur in such materials; however, the currently available structural analyzes are often contradictory and do not combine structural changes with changes in electrical properties. Therefore, the project will provide information on the mobility of ions in layered oxyhalides (especially high-entropy oxyhalides), mechanisms of electrical conductivity, structural changes in these materials generated by temperature, and changes generated by UV irradiation. In addition, the research will provide detailed information for further research into more structurally complex layered materials. The impact of basic research results obtained as part of the project implementation on the development of further research related to their applications is presented schematically in the figure below.



Schematic representation of the layered oxyhalides application fields in the context of testing in the proposed project dielectric and electrical properties

Ultimately, the project will provide a package of information on the dielectric properties of layered oxyhalides and the possibility of modifying them by changing the chemical composition, structure, morphology, and the action of physical factors: temperature and UV light.