

## Research project objectives

The aim of the project entitled "Functionalized graphene oxide as a new, high-performance adsorbent of heavy metal ions" is the synthesis and multifaceted characterization of a new generation of adsorbents for metal ions. The proposed project targets at the increase in the efficiency of the adsorption process of graphene oxide (GO) through its chemical functionalization with multidentate organic ligands (Fig.1). Such approach will directly impact on the development of a new generation of adsorbents, their potential application in the purification of aqueous solutions and removal of heavy metals and can be broadly seen as environmental protection.

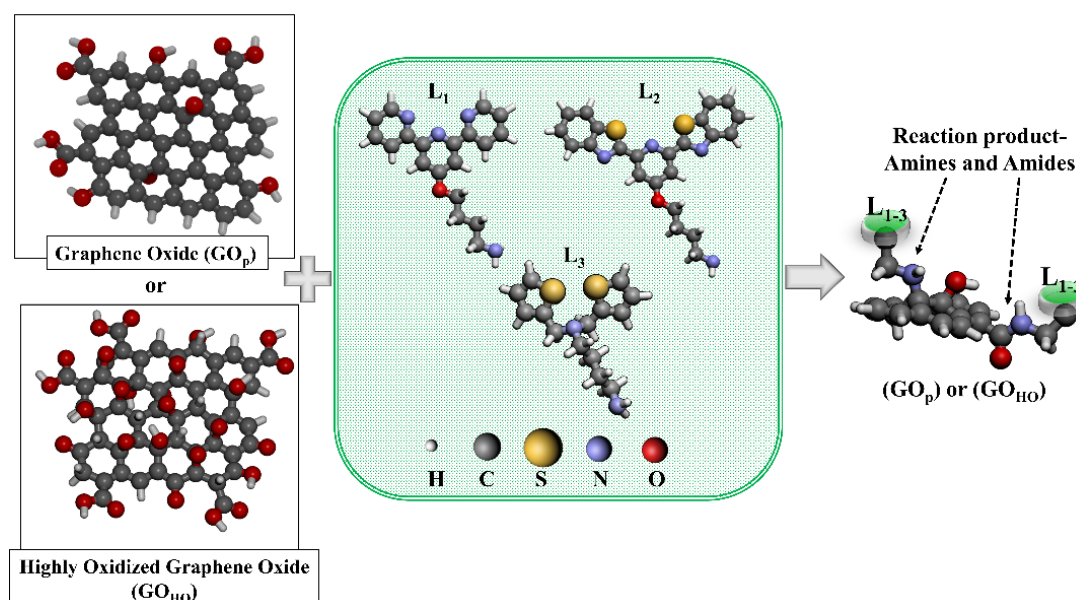


Figure 1. Schematic representation of graphene oxide (GO) functionalization.

## Basic research

Implementation of previous research by the project investigator in the group of prof. Paolo Samori (Strasbourg, France), which was based among others on the preparation and study of adsorption properties of graphene oxide derivatives, was the inspiration for the design of new adsorbents for heavy metal ions.

Graphene oxide due to its structure, which contains numerous oxygen-rich functional groups, is capable to capture pollutants (including metal ions) from aqueous dispersions/solutions. The functionalization of GO with suitable molecular building blocks can increase the strength of interactions (coordination bonds and/or electrostatic interactions) between the metal ions and the GO-based composite, which can unravel the potential of GO-based sorbents for their wider use. Noteworthy, the functionalization of GO with organic compounds described in this proposal has not been reported till date to increase the maximum adsorption capacity. The obtained sorption materials will be characterized by multi-aspect spectroscopic and morphological techniques.

## Research project impact

The knowledge gained during the implementation of the proposed research project will have a significant impact on understanding the relationship between the oxidation level of GO, its functionalization and the maximum adsorption capacity. The organic compounds that will be used for the functionalization of GO are oligopyridine- and polythiophene-based ligands (N and S donor) - a class of compounds displaying a wide spectrum of potential applications in areas such as supramolecular engineering and material chemistry. One of the main advantages of the current proposal will be the international collaboration between Adam Mickiewicz University (AMU) in Poznań and prestigious Institut de Science et d'Ingénierie Supramoléculaires (ISIS), University of Strasbourg (France), which will contribute to obtaining broad knowledge of adsorption materials and will allow the potential use of new adsorbents in the treatment of aqueous solutions from heavy metal ions. It is also important to note that the proposed research project has an interdisciplinary character, as it combines various scientific disciplines ranging from organic synthesis, through material chemistry, to adsorption processes.