Plan Overview

A Data Management Plan created using DMPTool

Title: Graphene and metal oxides composites: Application as toxic gas sensors

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Project abstract:

Modern advances in science and technology have improved the quality of human life and health significantly. Nevertheless, these advances also brought several problems. Among them, the need for real-time monitoring of toxic gases is one of the biggest and most alarming problems these days. There is a requirement for simple, sensitive, selective, and stable electronic sensors for either environmental monitoring or industrial applications. Graphene-based materials and nanostructured metal oxides have been pointed out as potential gas sensing materials due to its intrinsic large specific surface area and high electrical conductivity. More recently, nanocomposites have been prepared using graphene and nanostructured metal oxides. These nanocomposites are promising sensing materials because studies have shown they have good sensing properties close to room temperature. Additionally, laser-based techniques have attracted attention due to its great potential for synthesizing high-quality graphene-based devices. This methodology of synthesis have a great potential for mass production due to its rapid speed processing, nanometer spatial resolution and single-step process production that does not uses chemical reagents or high temperature. Within this context, this project proposes to study the sensing properties of nanocomposites fabricated with reduced graphene oxide and In2O3, ZnO e CuAlO2 nanoparticles Also, it is proposed to compare the sensing properties of sensors prepared with reduced graphene oxide obtained by traditional chemical route and by laser-based technique recently published.

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Graphene and metal oxides composites: Application as toxic gas sensors - Description of Data and Metadata produced by the project

All data of this project will the result of characterization experiments and the manufacture process. All data will be collected from experiments of X-ray diffraction, Raman Spectroscopy, X-ray photoelectron Spectroscopy, Differential Scanning Calorimetry, Fourier-transform infrared spectroscopy, electrical characterization, Uv-vis spectroscopy, photoluminescence spectroscopy will be available as CSV files. Scanning electron microscopy data will be available as TIFF images. Some data will be also available as png figures to facilitate visualization. Wherever possible, the data will be converted and saved in non-proprietary formats to facilitate further reuse by colleagues. All data should use no more than 1 Gb of space.

All data from this project will be stored in three main folders, related to each step of the experimental work:

1. Reduction of Graphene Oxide;

2. Defects on sputtered ZnO;

3. rGO-ZnO nanocomposites and gas sensing performance;

Inside each folder there will be other folders named after the scientific abbreviation of the technique used to collect the data. Folders named "raw" are used to store the data as created after the experiments, and other folder will contain the result of data analysis.

All data generated on this project will consist of the experimental results of different materials characterization techniques. The most important characterization techniques that will be used in this project are XRD, XPS, Raman spectroscopy, UV-vis spectropscopy, photoluminescence, DSC, SEM, FTIR, pictures, electrical analysis, gas sensing performance by continuously monitoring the electrical resistance of a film deposited over interdigitated electrodes during controlled exposures cycles of a target gas. All data will be shared in .csv format or tiff in case of SEM images.