

Multiparametric sensor platform for real-time biocontaminant aerial detection

Proposers

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Introduction:

Contamination of people, animals, foodstuffs, objects and several types of materials by biological agents are of major concern, especially by man or animal pathogens. However, some non-pathogenic agents are also relevant, mainly those associate with food spoilage, or those responsible with the breakdown of sterility, in certain types of equipments and health devices. The primary ways involved in the contamination process are: by contact (direct or indirect), or by air. Air spreading of biologic agents is probably the most important contamination pathway, and requires the aerosolization of biologic agents to effective. Most of the diseases that affect animals and humans are spread by air, in indoors and outdoors. Nevertheless, indoor spreading of biologic agents is most effective than outdoor spreading, due to confinement and agent proliferation. This is of particular importance in public places, such as hospitals, airports, covert stadiums, shopping centres, among others, where natural or intentional disease outbreaks can affect more effectively, a higher number of targets. Intentional releases of biologic agents, in bioterrorism actions, pose great concern to public health and to law enforcement authorities. These entities need even more, of technologies capable to sensing the atmosphere in a continuous way, for the presence of pathogens. Real time detection technologies are a crucial tool, to improve the response efficiency of authorities, in outbreaks situations.

The current technologies available in the market to detect aerosolized agents are cumbersome, expensive, have a high logistic foot print and most of them don't give a specific result in real-time. Most of these technologies are poor used and when an air analysis is needed, generally it is split in two main steps: 1) aerosol collection, with dedicated air samplers; 2) aerosol analysis, by culture and molecular methods.

Project outline/goals:

The limitations in the commercially available technologies, for real-time detection of biologic agents in aerosols, need to be improved in several aspects: 1) miniaturized, capable to be transported by hand or installed in robotic interfaces such as UAV (unman air vehicle), or UGV (unman ground vehicle); 2) fully integrated with the air sampling module and with the detection module; 3) real-time or near real-time detection of aerosolized agents.

The main project outline will be focused on the development of a compact aerosol detection biosensor, capable to sensing in real-time the presence of biologic agents in air. The candidate will integrate existing technologies in a multiparametric biosensor, capable to monitor chemical and physical parameters, with a low energy budget, and at a compact forma encasing. Tests will be done with aerial drones, in collaboration with iSkyex.

Student profile:

Profile sought: preference, but not limited, to students with a background in Electronics and/or Physics with an interest in Biology.