FRESP Final Short Report

The aim of this project was to develop a new respiratory protection device for first responders in the case of a chemical, biological, radiological or nuclear incident (be it an accidental or a deliberate release). At this moment, the majority of the first responders (e.g., paramedics, medics, policemen, private security) are not provided with any form of respiratory protection. For this, one can cite several reasons: cost, the extra training to use the protection adequately and the fact that most systems are either very cumbersome (e.g. self-containing systems) or dedicated to one type of agents (e.g. the different types of filters). Therefore, the system to be developed had to respond to a broad-spectrum of threats, to have a low cost, and should be easy to don. Furthermore, the general burden of wearing the system (breathing resistance, field of view, illegibility of speech,…) should be as low as possible, as the first responders will not be used to execute their tasks wearing any form of respiratory protection. Finally, the system should be easy to don on victims as this could considerable enhance their chances of survival when being evacuated from the incident site.

The project was divided into two main stages: the development of a novel and performing filter system and the integration of this system into a new type of hood.

Several filter systems have been developed and tested. This included new types of carbon materials, new synthesis routes for impregnated carbons and novel forms of activated carbon. Several conventional test methods had to be adapted to allow them to be used for these materials. After thorough testing against a wide range of biological and chemical compounds, and extensive trials on breathing resistance and weight, a final material and design were proposed. The filter with the best overall performance consists of an array of hexagonal activated carbon monoliths with a tailored pore structure, post-impregnated using a conventional method. This filter should enable the first responder to stay at least 20 minutes inside the incident perimeter without any specific knowledge about the chemical, biological or radiological agents present.

Two different hood types have been developed, each covering a different market segment. One hood is specifically designed as a low cost solution for the general first responder (and, by extension, even for the general public). This hood is entirely made of a transparent plastic (avoiding claustrophobia), is very easy do don, has a supplementary neck seal to increase the protection factor and takes very little space when stored away before use (e.g. in the glove compartment of an ambulance).

The second one is aimed at the specialised first responder. It is made of a breathable carbon material with a visor and filter interface. This makes it more expensive than the first one but lowers the heat burden and enhances comfort, enabling the specialist first responder to stay longer in the contaminated area (providing the use of a filter with an increased capacity).

At the end of the project, extensive field trials have been conducted. It is clear that neither the hoods, nor the filter are, as yet, market-ready, even though several patents are being filed. The prototypes clearly demonstrate the potential of all systems. As a result, and taking into account the economical feasibility study, the different industrial (SME) partners in this project will take this further and develop (partly joint) final products to be marketed.