

Characterization of the volatile organic components and heavy metals adsorbed to particulates generated in bushfires

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Project Aims

To test the hypotheses that:

- Particulates in bushfire smoke are no different from typical urban particulates, and,
- that the amounts of organic and heavy metals adsorbed to the particulates do not pose a threat to human health.

To meet these aims the following will be investigated:

- bushfire particle size range
- Adsorbed contaminant type and concentration
- Relationship between particle size and contaminant concentration
- What is the likely personal exposure of firefighters
- How do bushfire particles differ from those found in urban environments.

Project Outline

It is well known that bushfires generate high levels of particulates of various sizes [Evans, 1976; Vines, 1973]. Some of these particulates are less than 1 μm which may present a significant hazard to human health. While there have been studies on the relationship between the particulate load from bushfires and the incidence of asthma [Johnston, *et al.*, 2002], there appear to have been **no** studies conducted on the organics and heavy metals being transmitted via the particulates.

Research Significance of this Project

To date, there is no published work on the nature of the adsorbed pollutants on particulates from bushfires, this projects outputs will subsequently be used to help protect fire fighters and people living in the vicinity of bushfire prone areas.

Method

The project will consider, inhalable, respirable and fine [and possibly ultra fine] particles, with each type requiring an accurate capture method to allow for contaminant volume profiling with particle size.

Initially, inhalable particulates will be collected. These inhalable particulates will be used as an initial screening tool for further analysis. The next stage will involve collection of respirable samples, using cyclone sampling techniques. Analytical methods for both particle sizes will include heavy metal analysis using ICP-MS and organic compound analysis by GC/MS and possibly GC/GC/MS.

A comparison of the results from the analyses of both inhalable and respirable particulates will determine subsequent experiments. If there is a match between the profile of the two particulate fractions, then only one fraction will need to be further considered. If the two profiles are different, then subsequent experiments will require both types of particulates.

Ultrafine and fine particulates will require development of accurate sampling profiling and reproducible analytical techniques via the application of a suite of sophisticated surface analysis instrumentation. A significant number of test burns will be conducted in a specially devised chamber at the CSIRO Bushfire Research facility, and the refined sampling techniques taken to areas undergoing prescribed burns for further experimental validation. If the opportunity arises, samples will also be taken from bushfires as they occur where safe to do so and with permission of the relevant fire agencies.

Project timeline

Projected Project Outcomes

The project will provide significant new information on the characterization of particulates generated from fires, under varying burn conditions and varying fuel types.

The results will allow a more robust assessment of potential fire fighter health risks, due to contaminated particulate exposure at fire scenes.

As a consequence of the project, a more rigorous evaluation of the available Personal Protective Equipment (PPE), specifically respiratory equipment, will be undertaken, in conjunction with the PPE industry and national advice issued.

In the longer term, dissemination of the projects results will enhance Fire Authorities' ability to clearly advise the community in the vicinity of fires of their likely exposure and risk minimization strategies

References

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