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Characterising the organic/inorganic species in plumes from open uncontrolled industrial fires using incident contemporaneous FTIR monitoring: Supporting Public Health Risk Assessment

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From April 2010, across England, Scotland and Wales, a mechanism to manage public health risk from exposure to industrial major air pollution incidents was adopted. Called an Air Quality Cell (AQC), they are constituted with a multi-agency membership to advise on the public health risks at the time of the incident. An AQC can direct air pollution monitoring teams to attend an incident and it with ‘live’ air pollution data to support the characterisation of the public health risk from plume exposure across a community. A situational analysis of AQC incidents demonstrated that communities were most likely to be exposed to the consequences of open uncontrolled burning that involved registered waste management sites and a smaller number of unlawful fly-tipped sites. Arguably therefore, AQC incidents are an unintended consequence of waste management policies that include the application of the waste hierarchy.

Products of open uncontrolled combustion are a complex varying mixture of chemical species that derive from burn conditions (e.g., temperature, oxygen levels, contact times, turbulence) and the fuel (wastes) combusted. In developing the public health risk assessment during the incident of plume species, prior knowledge and their concentrations aids quantification of the risk and in so doing, reducing uncertainty.

In this paper, the collected ‘live’ monitoring data as reported directly to the AQCs from a Gasmet (DX 4030 or DX 4040) FTIR, has been used as the basis of our characterisation of the ground level concentrations of harmful organic and inorganic substances. This instrument had been pre-calibrated with the profiles for 24 common chemical species and deployed to 34 open uncontrolled burning incidents involving waste materials. Our analysis evaluated the monitored values against AEGL and ERPG acute exposure standards but also identified concern with the reported concentrations of specific organic species. Finally, FTIR results were used to develop a novel ‘finger printing’ method that supports the identification of the wastes involved in the fire. Outcomes from our work contribute to reducing uncertainty for practitioners undertaking the assessment of public health risk during incidents.