WeBIOPATR 2021

The Eighth International WEBIOPATR
Workshop & Conference
Particulate Matter: Research and Management

Abstracts of Keynote Invited Lectures and Contributed Papers

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Vinča Institute of Nuclear Sciences

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ABSTRACTS OF KEYNOTE INVITED LECTURES AND CONTRIBUTED PAPERS

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8.2 SOURCE APPORTIONMENT OF OXIDATIVE POTENTIAL – WHAT WE KNOW SO FAR

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The impact of exposure to particulate matter (PM) is assessed using the particle mass, size, concentration, and chemical composition. In recent works, it has been recognised that PM2.5 is not the best-suited metric to estimate and measure the effect of PM on human health. Particle mass may not be very informative of the number of ultrafine particles that have the highest potential to penetrate the deepest regions of the respiratory system and potentially cross the blood-brain barrier. Also, not all the components and sources are equally potent in driving the acute health effects of PM. The chemical composition of PM, surface reactivity and the oxidative potential (OP) of PM are proposed to be driving the adverse health effects. However, the findings presented in a limited sample of literary works in this field are conflicting.

Scientists are unified to nominate and validate potential techniques that can be better proxies for public health warnings and monitoring. Reactive oxygen species (ROS) measurements are one of the leading contenders to be applied for this purpose. The existing gap in knowledge is how well ROS measurements that present the reactivity of PM predict air toxicity. To better understand the relationship between the reactivity of particles and their OP and toxicity, particles from different sources and of the different chemical compositions should be tested.

Over the last couple of years, source apportionment methods were employed worldwide to understand better the processes contributing to and influencing concentrations and the residence time of PM in the atmosphere. To do this, direct modelling approaches such as chemistry transport models (CTMs) using tagged species (Kranenburg et al., 2013) or field studies coupled with receptor models (RMs) (Pernigotti et al., 2016), specifically positive matrix factorization (PMF) (Jain eta al., 2020) were used.

It has been established that PM originates from various sources. Particle formation processes are accompanied by a series of photochemical reactions in which ROS can be involved. Therefore, chemistry, reactivity, size and particle OP will vary within the urban environment from season to season, which induces significant changes in the health impacts. Field observations and modelling studies showed that primary and secondary sources of PM do not contribute equally to the OP (Daellenbackh et al., 2020). OP is mainly contained in small SOA particles, and is very well correlated with the transition metals, oxygenated organics (Stevanović et al., 2013) and the presence of persistent free radicals.

Not all the PM components were shown to have a contribution towards the OP. Therefore, it has become increasingly important to link the chemical species and sources of ambient PM with OP, which provides us with critical information to effectively reduce emissions from sources that release PM with more significant toxicity. Nevertheless, there is still much to be learned. A better understanding of source apportionment of ROS may help develop mitigation strategies to reduce mass concentrations, as it may be more effective to reduce specific sources and not the overall PM mass.

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