The Oxidative Potential of Particulate Matter: A case study in Lecce

Serena Potì[1, 4], Eva Merico[1], Marianna Conte[2], Florin Unga[1], Daniela Cesari[1], Adelaide Dinoi[1], Maria Rachele Guascito[1, 3], Anna Rita De Bartolomeo[3], Antonio Pennetta[1], Ermelinda Bloise[1], Giuseppe Deluca[1], Giuseppe Egidio De Benedetto[5], Roberto Ferrera[6], Enrico Bompadre[6], Daniele Contini[1].

1 Institute of Atmospheric Sciences and Climate - ISAC-CNR, Lecce, 73100, Italy
2 Institute of Atmospheric Sciences and Climate - ISAC-CNR, Roma, 00133, Italy
3 Department of Biological and Environmental Sciences and Technologies-DiSTeBA, University of Salento, Lecce, 73100, Italy
4 Department of Innovation Engineering, University of Salento, Lecce, 73100, Italy
5 Department of Cultural Heritage, University of Salento, Lecce, 73100, Italy
6 FAI Instruments s.r.l., Roma, 00133, Italy

The study of oxidative potential of particulate matter (PM) is a key element in understanding its potential adverse effects on biological systems. Acellular assays help indicate the ability of particulate matter to produce reactive oxygen species, which are linked to cellular damage and oxidative stress, providing useful information on health risks. In 2022, 371 monthly samples of PM10 and PM2.5 were collected using smart samplers (low flow) at various sites in the city of Lecce and its province (24 sites in total). The collected samples were subjected to different analytical techniques to obtain information on the chemical composition of PM. In particular: TOT (Thermal-Optical Transmittance) analysis to determine the carbonaceous fraction (OC/EC) using the EUSAAR2 protocol; ED-XRF to determine the content of major elements (using a Spectro Xepos analyser); DTT assay to estimate the oxidative potential; and High-Performance Ion Chromatography (IC) for the determination of soluble ions. After acquisition the complete dataset of chemical characterisation, a Source Apportionment analysis was conducted using the EPA PMF5.0 receptor model. This made it possible to identify the emission sources and quantify their contribution to PM and OP. The results show that, in the area studied, the sources contributing largest to both PM and OP are combustion sources, in particular combustion from vehicular traffic and biomass burning.