



## Characterisation of emissions and ambient air in the vicinity of an integrated steelmaking site with a Mobile Laboratory

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Here, we report the results of Max-Planck Institute for Chemistry (MPIC) Mobile Laboratory (“MoLa”) measurements within and in the surroundings of an integrated steel plant. For the first time, MoLa has been used to characterise particle- and gas-phase emissions from steelworks with high time resolution. MoLa measurements were made at three different types of location: 1) within the integrated steelworks; 2) in the vicinity of the steelworks (stationary measurements); and 3) driving up to ~20 km away from the steelworks (mobile measurements). The measurement campaign took place from June 22-28, 2010 within and in the vicinity of an integrated steelmaking facility in the UK.

MoLa is a vehicle with various state-of-the-art instruments for on-line measurements of gas- and particle-phase species, meteorological and location parameters. Instruments onboard MoLa enable stationary and mobile measurements of particle mass and number concentrations, a wide range of particles size distributions (5 nm – 32  $\mu\text{m}$ ) and chemical composition of e.g. non-refractory  $\text{PM}_{10}$  (NR- $\text{PM}_{10}$ ). MoLa also measures atmospheric trace gas species such as  $\text{O}_3$ ,  $\text{NO}_x$ ,  $\text{SO}_2$  and CO.

Within the integrated steelworks, a number of different diffuse emissions arising either from process sources or from area sources were sampled, with the aim of characterising sources in real time. The ability to sample at many locations in a very short time period is possible only due to the flexibility of the MoLa set-up. To successfully perform such measurements, the critical parameters are the location of MoLa and meteorological parameters such as wind direction. Owing to the layout of the steelworks and in order to comply with its safety regulations, MoLa sampling locations were predetermined. Therefore, while for some emission sources meteorology was favorable, the measurements of some sources had a contribution of other emissions.

The three types of measurements (sources, background and mobile) exhibit very different pollutant profiles. The extraction of emissions fingerprints of the individual sources from the measurements made within the steelworks shows that some operations are characterised by elevated concentrations and strong variations of species such as black carbon,  $\text{SO}_2$  and NR- $\text{PM}_{10}$  particles (e.g. coke ovens and blast furnaces) while others show lower species concentrations with small variations (e.g. coal handling plant). Stationary MoLa measurements in the surroundings of the integrated steelworks exhibited no influence of emissions from its processes and site activities, and provide an overview of background species concentrations characteristic for aged air masses arriving from several possible sources: urban, marine and/or rural. This background is also visible during measurements within the integrated steelworks. Finally, MoLa mobile measurements were characterised by a combination of aged urban, rural and marine air masses and sometimes with steelworks’ and fresh traffic emissions.

Here we present the detailed chemical speciation of NR- $\text{PM}_{10}$ , number and mass concentrations, and size distributions of particle-phase species, together with concentrations of gas-phase species, characteristic for various sources. We compare the measurements of polycyclic aromatic hydrocarbons (PAH) obtained by three different methods and instruments (HR-ToF-AMS, PAS, and off-line direct thermal extraction / GC-MS analysis of aerosol samples collected with an impactor). Finally, we compare our results to those available from previous laboratory and field studies.

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