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CHEMICAL CHARACTERIZATION OF AIRBORNE NANOPARTICLES IN AN INDUSTRIAL SCENARIO

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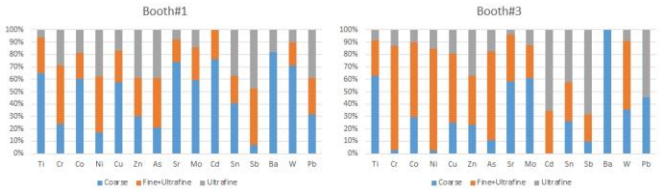
Atmospheric plasma spraying is applied at industrial scale to produce high-resistance coatings of metallic surfaces. Due to the high energies applied, it is a known source of nanoparticles (NP) which are released to workplace air and impact worker exposure in industrial facilities. NP emissions in this kind of scenario are characterized in terms of particle number concentrations, mean diameter and size distribution (Viana et al., 2017; Salmatonidis et al., under review), but data are lacking regarding the chemical properties and toxicity of these particles.

In this framework, this work aimed to characterize the chemical composition of course, fine and ultrafine aerosols emitted during plasma spraying in a real-world setting, with the ultimate goal to support ongoing toxicity assessments of the same aerosols. Two different scenarios (Booths #1 and #3) were assessed. Particles were sampled onto Teflon filters and in suspension using an aerosol concentration enrichment system (VACES; Kim et al., 2001), and analyzed by means of ICP-MS, ICP-OES and XRF. An inter-comparison between analytical methods was used for quality assurance. Results evidenced a major enrichment in potentially health hazardous metals (Cr, Ni, W) sourcing directly from the feedstock in both scenarios, as well as in major elements (Al, Ca, Fe) with different possible source origins (including outdoor infiltration). The elements with the highest enrichments in the ultrafine fraction were Zn, As, Sb and Ni in Booth#1, and Cd, Sb and Pb in Booth #3, highlighting the potential health risks linked to exposure to this kind of aerosols. Aerosol chemical properties were correlated with bulk material composition, to understand the relationship between bulk composition and NP emissions in the three size fractions analysed. Toxicity assessments will provide further quantitative insights into the health hazards of this kind of exposure.



Session 4
4.1 Occupational risk assessment