Plastic in the Air?! – Spider webs as spatial mirrors for microplastics and tire wear in urban air

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Abstract

Urban air is highly imprinted by anthropogenic activities resulting in micro sized particulate matter release. Besides dust, soot, brake and tire wear particle abrasion (TWP) the content of common microplastics (MP) in air, their composition, distribution and transport potential have come into the focus of investigations recently. However, available quantitative data sets are highly limited.
Spider webs act as non-selective, climate- and season-independent particle traps, which occur worldwide. Successfully applied as passive samplers for inorganic contaminants 30 years ago, we investigate spider webs as a cheap and easily accessible biomonitor for evaluation of MP and TWP composition, spatial distribution and relative concentrations in urban air (1).

Samples were collected in covered bus stops at different trajectories and times in a mid-sized German city. The spider webs were processed with an advanced oxidation process (Fentons reagent) and analysed with PY-GC/MS. Polymers were quantified as backbone-related clusters (indicated by prefix "C") as introduced earlier. Various soot samples were analyzed, to evaluate potential interferences with the C-PVC indicator naphthalene, subsequently a factor was introduced to correct the C-PVC data (indicated by *). TWP and "traditional" MP were present in all samples representing 1 to 10% of the web's total mass. Most dominant was car tire wear (Ø 41%), followed by C-PET (Ø 36%) and *C-PVC (Ø 12%). C-PET is most likely derived from textile fibers, *C-PVC is assumed to originate notably from road markings. Although frequently found, truck tire wear, C-PE, C-PP, C-PS, C-PMMA and C-PC were present in much lower concentrations (Ø < 6.4%). TWP prevails in highly traffic-influenced sampling areas, while "traditional" MP dominated in residential areas. Spider webs are suggested as a globally applicable "pollution mirror" to get an overview of spatial and temporal MP contamination trends as well as hotspots in urban air (outdoor/indoor).
(1) Goßmann et al*, doi.org/10.1016/j.scitotenv.2022.155008*

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