

## **Characterizing Tire Crumb Rubber for Exposure Assessment**

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### **ABSTRACT**

Tire crumb rubber derived from recycled tires is widely used as infill material in synthetic turf fields in the United States. An estimated 95% of the over 12,000 installed fields in the U.S. use tire crumb rubber infill alone or mixed with sand or alternative materials. Concerns have been raised about exposures of field users to the many potential tire chemical constituents. Most previous U.S. research studies examining tire crumb rubber at synthetic fields have been relatively small, restricted to a few fields or material sources, and limited chemical constituents measured. Characterizing chemical, physical, and microbiological constituents and properties for tire crumb rubber is needed to improve human exposure assessment. Working under the U.S. Federal Research Action Plan, researchers collected tire crumb samples from nine tire recycling plants and 25 outdoor and 15 indoor synthetic turf fields across the U.S. Field ages ranged from new installations to 12 years old. Tire crumb samples were analyzed for metals using acid digestion and ICP/MS. SVOCs were extracted with 1:1 hexane/acetone followed by GC/MS and LC/MS analyses. Dynamic chamber tests measured VOC and SVOC emissions at 25° and 60°C. SVOC and VOC analyses included both targeted analyses for chemicals of interest (e.g. polycyclic aromatic hydrocarbons) as well as non-targeted analyses to more fully characterize chemical constituents. Particle size, moisture content, and sand fraction were characterized. Bioaccessibility tests were performed for metals and SVOCs using simulated saliva, sweat, and gastric fluids. Tire crumb rubber samples were found to contain many metal, SVOC, and VOC chemicals across a wide range of concentrations. Chemical constituent information is important but not sufficient for assessing human exposures. Material variability, environmental conditions, bioaccessibility, and human activity factors are among the complex parameters needed to understand exposures at synthetic turf fields.