

Characterization of Semi-Volatile Organic Chemicals from Tire Crumb Rubber

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ABSTRACT

Recycled tire crumb rubber (TCR) is often used as infill material in synthetic turf playing fields as well as some playgrounds. Concerns have been raised about the safety of this material and a multi-agency Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds was developed to investigate key factors that could impact the environment and human health. Here we present work done to characterize semi-volatile organic compounds (SVOCs) from direct solvent extraction of TCR and airborne emissions experiments. A wide range of SVOCs (including PAHs, phthalates, and chemicals related to rubber manufacturing) were selected for targeted analysis. Solvent selection, extraction techniques, and instrument parameters were investigated in order to better understand the TCR material and to develop the methods and appropriate QA/QC required for sample analysis. TCR samples were collected from nine tire recycling plants and 40 synthetic turf fields across the U.S. and were divided into subsamples for characterization experiments. TCR and emissions samples collected on PUF were extracted with 1:1 acetone:hexane. Emissions experiments were conducted at 25°C, 46 % Relative Humidity (RH) and 1 h⁻¹ air change (ACH) rate, and 60°C, 6.6 % RH, 1 h⁻¹ ACH in 53 L dynamic emission chambers. Data were acquired for all samples using GC/MS/MS in MRM mode with a calibration range of 0.1-500 pg/μL. MQLs, which were derived based on accuracy of standards compared to the calibration curves, ranged from 0.1-10 pg/μL. Non-targeted analysis was also performed by acquiring data by GCMS in scan mode (50-550 m/z) and then deconvoluting and library matching the spectra to tentatively identify components. Data obtained from the SVOC analyses will be used in conjunction with the other analyses that were conducted as part of the Federal Research Action Plan to identify key TCR chemical constituents, aid exposure assessment, and inform future studies related to TCR exposure.