

Tire Wear Chemicals in the Urban Atmosphere: Significant Contributions of Tire Wear Particles to PM_{2.5}

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Tire wear particles (TWPs) containing tire wear chemicals (TWCs) are of global concern due to their large emissions and potential toxicity. However, TWP contributions to urban fine particles are poorly understood. Here, 72 paired gas-phase and PM_{2.5} samples were collected in the urban air of the Pearl River Delta, China. The concentrations of 54 compounds were determined, and 28 TWCs were detected with total concentrations of 3130–317,000 pg/m³. Most p-phenylenediamines (PPDs) were unstable in the solvent, likely leading to their low detection rates. The TWCs were mainly (73±26%) in the gas phase. 2-OH-benzothiazole contributed 82±21% of the gas-phase TWCs and benzothiazole-2-sulfonic acid contributed 74±18% of the TWCs in PM_{2.5}. Guangzhou and Foshan were “hotspots”. Most TWC concentrations significantly correlated with the road length nearby. More particulate TWCs were observed than model predictions, probably due to the impacts of non-exchangeable portion and sampling artifacts. Source apportionment combined with characteristic molecular markers indicated that TWPs contributed 13±7% of urban PM_{2.5}. Our study demonstrates that TWPs are important contributors of urban air pollution that could pose risks to humans. There is an urgent need to develop strategies to decrease TWP emissions along with broader urban air quality improvement strategies.