New study explores single-particle mass spectral signatures and real-world emissions of brake wear particles

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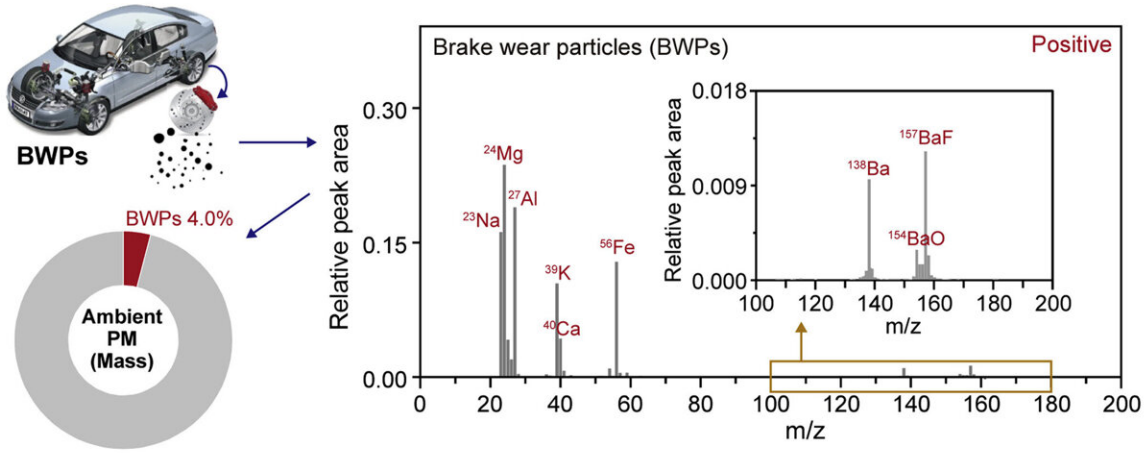

Credit: *Environmental Science and Ecotechnology* (2023). DOI: 10.1016/j.ese.2023.100240

In a new study published in the journal *Environmental Science and Ecotechnology*, researchers from Nankai University combined a brake dynamometer and a single-particle aerosol mass spectrometer to obtain single-particle mass spectra of BWPs and quantify real-world BWP emissions through a tunnel observation in Tianjin, China.

The researchers identified three main types of brake particles: barium

(Ba)-containing particles, mineral particles, and carbon-containing particles, contributing 44.2%, 43.4%, and 10.3% of the total BWP concentration, respectively. Ba-containing particles demonstrated distinct characteristics and serve as an excellent indicator for estimating ambient BWP concentrations.

Using this indicator, the team found that approximately 4.0% of the PM in the tunnel could be attributed to brake wear, with the real-world fleet-average emission factor of 0.28 mg per km per vehicle.

This pioneering research significantly reduces the uncertainty surrounding BWP contributions in complex atmospheric environments and offers important reference data for assessing the health risks and potential chemical processes involving BWPs. The novel approach of the study holds promise for future applications in diverse atmospheric conditions, providing crucial information to guide governments in developing BWP control measures, particularly in light of the escalating impact of BWPs on urban atmospheres worldwide.

More information: Jiayuan Liu et al, Brake wear-derived particles: Single-particle mass spectral signatures and real-world emissions, *Environmental Science and Ecotechnology* (2023). DOI: 10.1016/j.ese.2023.100240

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