

Quantitative assessment of nano-plastic aerosol particles emitted during machining of carbon fiber reinforced plastic

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Abstract:

Focusing on the relatively unexplored presence of micro- and nano-plastic aerosol particles, this study quantitatively assessed the emission of nano-plastic particles during the machining of carbon fiber reinforced plastic (CFRP) in the working environment. Measurements of aerosol particles smaller than 1 μm in size were performed by aerosol mass spectrometry. The findings revealed that concentrations of carbonous aerosol particles (organic aerosol and refractory black carbon (rBC)) were higher during working hours than during non-working hours. Positive matrix factorization identified CFRP particles as a significant source, contributing an average of approximately 30% of concentration of carbonous aerosol particles during working hours. This source apportionment was corroborated by the presence of bisphenol A and F fragments, principal components of the epoxy resins used in CFRP, and was corroborated by similarities to the carbon cluster ion distribution observed in rBC during CFRP pipe-cutting operations. Further, the particle size distribution suggested the existence of plastic aerosol particles smaller than 100 nm. This study established the method to quantitatively distinguish nano-plastic aerosol particles from other aerosol particles in high temporal resolution and these techniques are useful for accurately assessing exposure to nano-plastic aerosol particles in working environments.

* Excerpted from online journal website (Click the title)

Frontier Labs Products used:

Multi-Shot Pyrolyzer (EGA/PY-3030D), Auto-Shot Sampler (AS-2020E), MicroJet Cryo-Trap (MJT-2030E), UADTM-2.5N, Eco-Cup