# Chemical composition and source of diesel exhaust nanoparticles (<0.030 μm)

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## Abstract

The size distribution of particle number and comprehensive chemical composition (elemental and organic carbon, elements, ions) by particle size (Dp: 0.010–10 μm) were measured in the exhausts from an 8-L diesel engine equipped with no exhaust aftertreatment system under a no-load and a transient conditions. High concentrations of nanoparticles were emitted under the no-load condition even using the low-sulfur (8 ppm) fuel. In the nanoparticles (Dp<0.032 μm), organic carbon comprised a major part (≈80%) of the measured components, and elemental carbon comprised only 8–15% of them, and elements and ions including sulfate occupied only small percentages of them. Elements contained in lubricating oil (Ca, Zn, S, P, Si, and Cl) in high level were also observed in high concentrations in the nanoparticles. Furthermore, hopane concentrations per particle mass were higher in smaller particles, and chromatogram pattern of nanoparticles obtained by gas chromatography/mass spectrometry were similar to those for lubricating oil. These results indicate that lubricating oil was the primary components of the nanoparticles under the no-load condition. It is suggested that organics in lubricating oil condensed and formed nanoparticles.