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Effect of organic compounds on nanoparticle formation in diluted diesel exhaust

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Abstract. The nucleation of nanoparticles in the exhaust of a modern light-duty diesel vehicle was investigated on a chassis dynamometer. This laboratory study is focused on the influence of volatile organic compounds (VOCs) on nucleation of volatile nanoparticles. Different organic compounds were added to the dilution air of the particle sampling under different sampling conditions. Sample temperature and relative sample humidity were varied in a wide range. The number size distribution of the particles was measured with a scanning mobility particle sizer (SMPS) and showed significant differences in response to the added organic compounds. While the nucleation mode particles showed a large variation in concentration, the accumulation mode particles remained unchanged for all compounds. Depending on the functional group, organic compounds were capable of initiating and increasing (alcohols and toluene) or decreasing (acetone, aniline, and methyl tert-butyl ether (MTBE)) nucleation mode particles. Short volatile aliphatic hydrocarbons (hexane and cyclohexane) turned out to be without effect on nucleation of nanoparticles. Possible reasons for the differences are discussed.

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