Geophysical Research Abstracts
Vol. 19, EGU2017-3716, 2017
EGU General Assembly 2017

Primary Emission and the Potential of Secondary Aerosol Formation from Chinese Gasoline Engine Exhaust

Min Hu (1), Jianfei Peng (1), Yanhong Qin (1), Zhuofei Du (1), Mengjin Li (1), Rong Zheng (2), Jing Zheng (1), Dongjie Shang (1), Sihua Lu (1), Yusheng Wu (1), Limin Zeng (1), Song Guo (1), Min Shao (1), Yinhui Wang (2), and Shijin Shuai (2)

(1) State Key Joint Laboratory of Environmental Simulation and Pollution Control, College of Environmental Sciences and Engineering, Peking University, Beijing, China (minhu@pku.edu.cn), (2) State key Laboratory of Automotive Safety and Energy, Department of Automotive Engineering, Tsinghua University, Beijing, China (sjshuai@mail.tsinghua.edu.cn)

Along with the urbanization and economic growth, vehicle population in China reached 269 million, ranked the second in the world in 2015. Gasoline vehicle is identified to be the main source for urban PM2.5 in China, accounting for 15%-31%. In this study the impact of fuel components on PM2.5 and volatile organic compounds (VOCs) emissions from a gasoline port fuel injection (PFI) engine and a gasoline direct injection (GDI) engine are discussed. Results show that, higher proportion of aromatics, alkenes or sulfur in gasoline fuel will lead to higher PM emissions. The PM from the PFI engine mainly consists of OC and a small amount of EC and inorganic ions, while the PM discharge from the GDI engine mainly consists of EC, OM and a small amount of inorganic ions.
Since the GDI engines can reduce fuel consumption and CO_2 emissions, and it would become more and more popular in the near future. The characteristics of POM component, emission factors and source profile were investigated from GDI engine, particularly focused on the effect of engine speed, load and the catalyst, which will be very much helpful for source identification as source indicators.
Chamber experiments were conducted to quantify the potential of secondary aerosol formation from exhaust of a PFI gasoline engine and China V gasoline fuel. During 4-5 h simulation, equivalent to10 days of atmospheric photo-oxidation in Beijing, the extreme SOA production was 426 $\pm$ 85 mg/kg fuel, with high precursors and OH exposure. 14% of SOA measured in the chamber experiments could be explained through the oxidation of speciated single-ring aromatics. Unspeciated precursors, such as intermediate-volatility organic compounds and semi-volatility organic compounds, might be significant for SOA formation from gasoline VOCs. We concluded that reduction of emissions of aerosol precursor gases from vehicles is essential to mediate pollution in China.