Geophysical Research Abstracts
Vol. 13, EGU2011-5471, 2011
EGU General Assembly 2011

Contributions of VOCs to the ozone and secondary organic aerosol formation in Seoul, Korea

Hye Jung Shin (1,2), Jong Choon Kim (2), Suk Jo Lee (2), and Yong Pyo Kim (1)

(1) Ewha Womans University, Republic Of Korea (shjoung76@hanmail.net), (2) National Institute of Environmental Research, Republic of Korea

Characteristics of VOCs and those annual trends in Seoul are investigated. The annual concentration of VOCs (93.6 ppbC $\sim$ 278.1 ppbC) shows decreasing trend from 2004 to 2008 implying successful accomplishment of VOCs emission control strategy by 'Special Act on Metropolitan Air Quality Improvement' which has been implemented since 2005 in Seoul, still the VOCs concentration in Seoul is higher than those measured at other developed countries. The portion of low carbon alkanes (C2-C6) is major accounting for 41.2 % $\pm$ 7.2 % of the total VOCs concentration, followed by aromatics (C6-C10) (41.0 % $\pm$ 8.2 %). The most abundant component is toluene accounting for over 25 % of the total VOCs concentration, followed by low carbon alkanes (C2-C6). In addition, the formation potential of individual VOC on ozone and SOA are discussed. Even though the portion of low carbon alkanes (C2-C6) is the highest in the concentration basis, the contribution of aromatics (C6-C10) is the highest in ozone formation potential with 40.2 % $\sim$ 57.6 % of the total ozone production contribution due to their high POCP values followed by low carbon alkanes (C2-C6) (20.9 % $\sim$ 32.5 %). The most contributing component on ozone formation is toluene accounting for about 30 % of the total ozone formation due to the highest concentration.

The total SOA formation potential of VOCs ranged from 1.9 [U+F06D]g m-3 to 8.2 [U+F06D]g m-3. The SOA formed from aromatics (C6-C10) is the most contributing, ranged from 1.7 [U+F06D]g m-3 to 7.6 [U+F06D]g m-3 accounting for over 90 % of the total SOA formation followed by those from high carbon alkanes (C7-C10) (0.09 $\sim$ 0.5 [U+F06D]g m-3).

It is concluded that the solvent usage, which is the main emission source of toluene, m/p-xylene, o-xylene, and ethylbenzene, is the most important emission source for concurrent control of ozone and SOA level in Seoul considering the ozone and SOA production contribution of individual VOC. The vehicle exhaust mainly composed of butanes, ethylene, propylene, toluene, m/p-xylene, and trimethylbenzenes is the second largest contributing emission source to the ozone and SOA formation. It is inferred that the solvent usage control has the political priority for the reduction of ambient level of ozone and SOA concurrently. Traffic-related emissions such as vehicle exhaust and gasoline vaporation are also emission sources to be strongly controlled. Thus, the current emission control strategies focusing on solvent usage control and traffic related emission control are adequate to reduce the pollution level of Seoul Metropolitan Region. The emission of high carbon alkanes, which are emitted from meat cooking and gasoline powered motor vehicle with strong emission rate, are also considered to be controlled due to relatively high SOA formation potential. Thus, additional control strategy such as controlling the emission from meat cooking is needed to be considered for further reduction of VOCs related pollution level in Seoul.