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Intermediate Volatility Organic Compound Emissions from On-road Gasoline Vehicles

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China is a in a high-growth state with soaring increase in vehicles. The rapid increase (∼26 fold in 25 years) in on-road vehicle fleet in China made it a great burden on air quality and human health. Previous studies showed that apart from the acknowledged reactive VOCs such as light aromatics, alkenes and aldehydes, intermediate volatility organic compounds (IVOCs) could not be ignored in the emission inventory. It can contribute as much, or much higher to secondary organic aerosol (SOA) compared with VOCs. However, few studies focused on IVOCs emissions from Chinese light-duty gasoline vehicles which great limited our understanding on contributions of gasoline vehicles to SOA formation in China. Considering the unique atmospheric conditions and different fuel compositions of China, a full sculpture of IVOCs emission should be carried out. In this study, speciated and unspeciated IVOCs emissions from an in-use gasoline vehicle based on direct inject engine were collected during chassis engine dynamometer testing. IVOCs were quantified using gas chromatography/mass spectrometry analysis coupled with Gerstel thermal desorption sample extraction and injection system collected from a constant volume sampler. About 20% of the IVOCs could be specified with others existing as unspecified IVOCs. The unspecified IVOCs could be divided into two lumps, including unspeciated branched alkanes and cyclic compounds. The specified and unspecified IVOCs were then divided in to 11 retention-time based bins to study its SOA formation ability. We test the influence of different conditions i.e. cycles, fuel compositions and starting mode on IVOCs emissions. The mass, volatility and chemical speciation of IVOCs from different conditions were also examined. The relationships between IVOCs, POA and hydrocarbons were investigated. Our results demonstrated that IVOCs are a great class of SOA precursors for China and provide observational constraints on IVOC emission factors and chemical specification to facilitate their inclusion into atmospheric chemistry models. We also evaluate emission factors of ethanol-added gasoline to provide an environmentally-based prospective of ethanol-added gasoline in future market which would provide effective evidence for policy making.