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Preface

The serious air pollution problems in China have significantly affected the development of China's economy and society, especially in key areas such as Beijing-Tianjin-Hebei, Yangtze River Delta, and Pearl River Delta, which has aroused widespread concern throughout society. With the launch of the MOST (Ministry Of Science and Technology) key project for Air Pollution Formation Mechanism and Control Technology during the 13th Five-Year Plan, remarkable results have been achieved in recent years, such as new breakthroughs in air pollution monitoring technology, and new findings on haze formation mechanisms as well as its driving force - the atmospheric oxidation capacity. The acute and chronic health risks of air pollution to Chinese inhabitants have been quantitatively analyzed, state-of-the-art technologies to ensure ultra-low emissions from traffic sources and the non-electrical industry have been developed, improvements in air quality management technology and the realization of joint prevention and control technology for air pollution in typical city clusters has been achieved. With the support of the above new technological achievements, China has successfully achieved steady and fast economic growth accompanied by rapid improvement of the ambient air quality nationwide since the start of the 13th Five-Year Plan period.

In this special issue, we introduce the achievements of the MOST key project for Air Pollution Formation Mechanism and Control Technology (2016-2022) with 41 invited papers under the framework of the project - 'Principles and Technical Approaches to Regional Air Quality Regulation'.

These papers were invited and organized along the following five themes. Theme I summarizes the scientific findings in the field of 'Formation Mechanism and Health Effect of Air Pollution Complex', including reviews on the formation mechanism of sulfate and nitrate, the dry deposition mechanism of PM_{2.5}, the transport of air pollutants, laboratory-determined chemical kinetic parameters, commonly used chemical mechanisms, new technological outlook for the measurement of organic peroxy radicals, quantitative determination of the atmospheric oxidation capacity, and the health risks of fine particulate matters. Theme II summarizes the major achievements obtained in recent years in China in the field of 'Atmospheric Environment Monitoring Technology and Equipment', including reviews of land-air-sea-space stereoscopic monitoring technology, remote sensing of the atmospheric environment from space, novel techniques for highly sensitive detection of atmospheric free radicals and nanoparticles, key emer-

gency response technology for abrupt air pollution accidents, vertical aerosol data assimilation technology, and novel technology for online monitoring of ultra-low emissions from pollution sources. Theme III summarizes the recent progress and major achievements in 'Air Pollution Control Technologies in China', including ultra-low emission and multi-pollutant control technologies for sulfur dioxide (SO₂), nitrogen oxide (NO_x), particle matter, volatile organic compounds (VOCs) and other pollutants in major industries, such as power, steel, building materials, nonferrous metals, petrochemical, and chemical industries, and in mobile pollution sources, such as gasoline vehicles, diesel engine cars, non-road machineries, vessels, and so on. Theme IV summarizes the progress and major achievements on 'the Technology of Air Quality Management in China', including systematic reviews on the evaluation of air quality, the costs and benefits of air pollution control policies, the assessment of the health risks of air pollutants, the prospects of pollutant emission and ambient air quality standards, the synergic control strategy of PM_{2.5} and O₃ and technology development of China's roadmap for air quality improvement. Theme V summarizes the major achievements in the field of 'Demonstration of Joint Prevention and Control Technology for Air Pollution', including the development of air pollution control policy-making support systems through accurately predicting the air quality response to emissions and evaluating costs and benefits, application of the system in designating synergic PM_{2.5} and O₃ control strategies in key city clusters such as the Yangtze River Delta and Pearl River Delta Region, and suggestions for a 'multi-pollutant, cross-medium and multi-objective' environmental management system for future joint prevention and control of air pollution in China.

We think this special issue will serve as an international communication window on the MOST key project and a document to record the accomplishments of the generation of scientists working during the 13th Five-Year Plan period in China on the formation mechanism and control of air pollution. We welcome further international collaborations for the upcoming 14th Five-Year Plan period for joint development and commercialization of the new technologies for both scientific study and social applications.

The helpful contributions of the steering committee of the MOST key project - Prof. Jiming Hao, Prof. Yuanhang Zhang, Prof. Wenqing Liu, Prof. Fahe Chai, Prof. Jinnan Wang, and Prof. Xiang Gao, the MOST key project manager - Lei Wang and Lanying Wang, as well as the JES editors - Qingcai Feng and

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