FINDING A CLEARER PATH

A conversation with **CAO JUNJI**, Ph.D., director, Key Laboratory of Aerosol Chemistry and Physics, Institute of Earth Environment, Chinese Academy of Sciences

Severe smog events in China have alerted scientists and the public to the danger of small particles suspended in the air. The Chinese Academy of Sciences (CAS) established the Key Laboratory on Aerosol Chemistry and Physics (KLACP) in 2014 to learn more about aerosols and their climatic and environmental effects. Here, Cao Junji, director of KLACP, talks about his laboratory's efforts to improve air quality.

In what circumstances was KLACP founded?

In 2004, after working as a visiting scholar in Hong Kong, I was appointed to lead a laboratory on dust and environment at IEE, which received strong support from Dr An Zhisheng, a CAS member. In response to the rising urgent needs for atmospheric environment protection, we proposed establishing a key laboratory on aerosols in 2012, which was approved by CAS in 2014. Guided by national development strategies, we seek to develop technologies for pollution control to support China's participation in climate negotiations and environmental improvement actions.

What are some major research achievements at KLACP?

We apply field observation, lab analysis, mathematic modelling and a range of approaches to study chemical and physical changes of aerosols and their environmental effects. In support of $PM_{2.5}$ control, we launched simultaneous observation in 14 Chinese cities in 2003 and obtained comprehensive data on $PM_{2.5}$ concentration (these are fine particles with aerodynamic diameters less than or equal to 2.5 microns), chemical composition and spatial distribution. Our data allowed for China's earliest simultaneous $PM_{2.5}$ and chemical profiles, which provided a baseline for a $PM_{2.5}$ map. Based on more than ten years of continuous observation from our Xi'an station, we've developed the longest daily $PM_{2.5}$ database in China, and perhaps the world, which will be used for environmental, health and climatic research. Our works have contributed to local and national policy for $PM_{2.5}$ control.

By studying serious haze events in four megacities in 2013, we have quantified the contribution of secondary aerosol to particle pollution, and increased understanding of the cause of haze pollution in China. Our findings were reported in *Nature* in 2014, China's first such high-impact publication in the air pollution field. Based on our intensive study on pollutant degradation using photocatalytic technologies, our pollution control team has designed a series of highly efficient nano photocatalytic materials and devices, which can be used in the degradation of nitrogen oxides and volatile organic compounds (VOCs) secondary aerosols precursors of great interest in this scientific discipline.

What attracted you to aerosol research?

My background is geology, but, just out of interest, I focused on atmospheric chemistry for my PhD study. In 1999, with support from a UNDP project, I studied in a renowned aerosol research lab in the United States, which brought me firmly into this area.

The large quantity of atmospheric aerosols, and their wide variability in composition and forms, are among the most harmful air pollutants. Atmospheric aerosols affect our health, the climate, crop yields and the whole ecosystem. Since 2011, China's air pollution problem has attracted wide public attention, which led me to examine the mechanisms of aerosol formation and their environmental effects. Air pollution events are global and have historic precedence. I believe we can find appropriate control approaches via research.

How does KLACP contribute to air pollution control?

We tackle air pollution primarily by applying advanced technologies to control its sources and environmental pollutants. The former can be facilitated with improved industrial procedures and equipment. For the latter, filtering and electrostatic precipitation technologies are typically used. At KLACP we consider the complex composition of pollutants and take an integrated approach that combines the catalyst degradation technology. An example is a large-scale, solar energy-powered air cleaning system we recently developed. It can remove atmospheric particles and their precursors effectively, processing 8 million cubic metres of air daily and achieving filtration efficiency of 90% for $PM_{2.5}$ and 80% for sulphates and nitrates.

This year, we are launching the *Journal of Aerosol Science and Engineering* with Springer Nature to provide a long-term platform for promoting pollution control research.

What facilities are provided to KLACP researchers?

We are looking for high-level technology talents. As a key laboratory of CAS and of Shaanxi Province, we boast state-of-the-art facilities, such as the Aerosol Mass Spectrometry, and a comprehensive range of instruments, from carbon analysers to isotopic equipment. Our six advanced research platforms allow high-precision analysis for large-scale major projects. We have created a supportive environment that encourages motivation and interdisciplinary collaboration. We also offer ample opportunities for international exchange through joint research programmes and the hosting of conferences. Striving to be the best aerosol research lab in Asia, we welcome the world's aerosol geniuses to join us.

KLACP

www.klacp.ac.cn/en/

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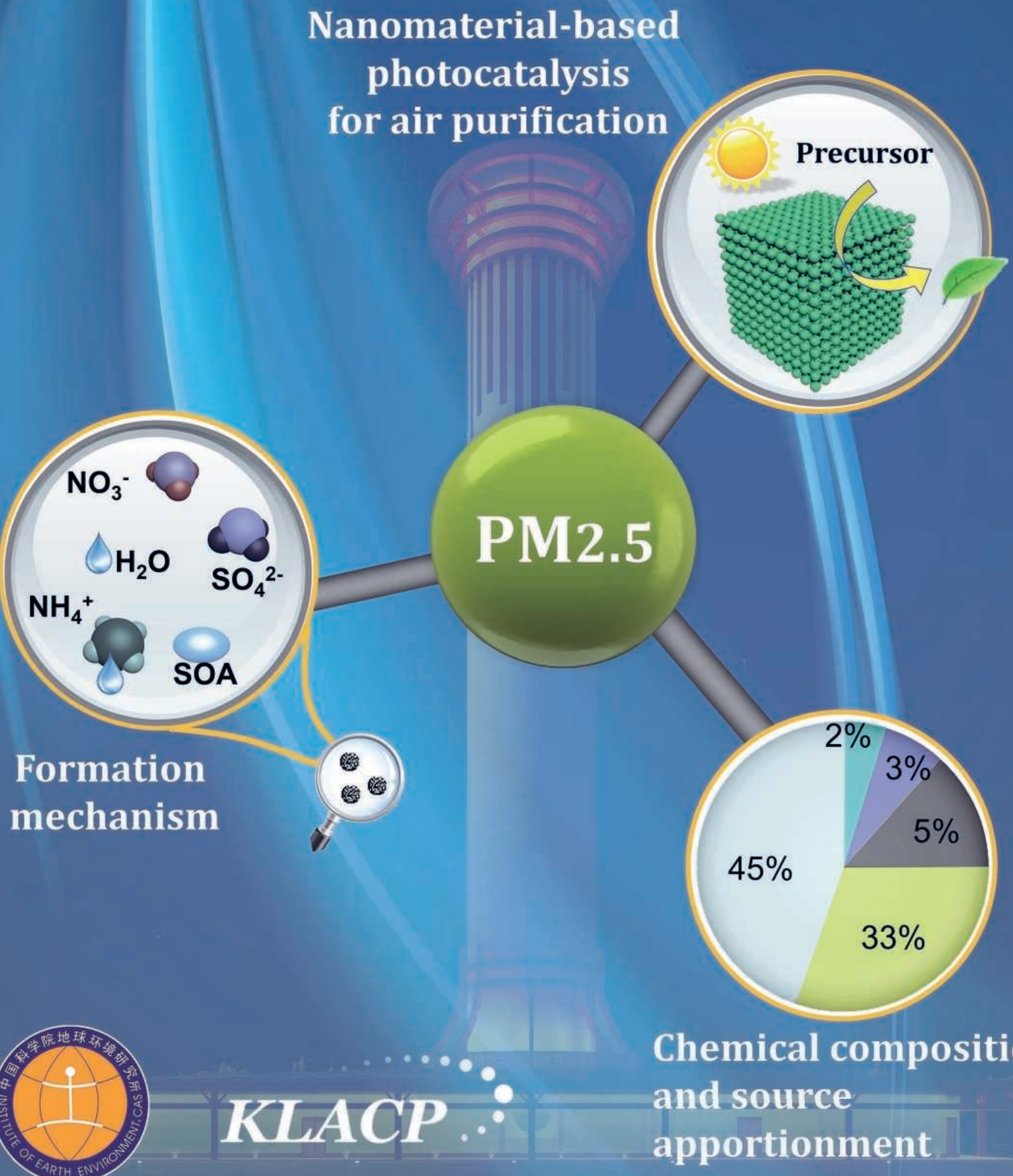

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