

# Research is getting closer to understanding critical nucleus in haze formation

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Haze, scientifically known as atmospheric aerosols - microscopic particles suspended in the Earth's atmosphere - represents a major environmental problem because it degrades visibility, affects human health and influences the climate. Despite its profound impacts, how the haze is formed is not fully understood, says a Texas A&M University professor of atmospheric sciences and chemistry who has studied air chemistry for more than 20 years.

Professor Renyi Zhang published his work in the June 11 issue of *Science* magazine, summarizing recent findings and new research directions that could pave the way for a better understanding of [aerosol](#) formation.

"Aerosols, also referred to as [haze](#), influence climate by absorbing and reflecting solar radiation and modifying cloud formation," he explains. "A better understanding of how aerosols form in the [atmosphere](#) will greatly improve climate models.

"But, formation of aerosols in the atmosphere is not fully understood, particularly at the molecular level, creating one of the largest sources of uncertainty in climate predictions," he adds.

For aerosols to form, the bonding particles must cross an energy threshold, which the scientists call nucleation barrier. Once the barrier is crossed, aerosol formation can happen spontaneously, he notes.

The interaction between organic acids and sulfuric acid can facilitate the crossing of the barrier by creating a critical nucleus, the Texas A&M professor says in the Science article.

Large amounts of organic gases are emitted to the atmosphere by plants, industry and automobiles and form organic acids; sulfur dioxide, on the other hand, are produced by human activities, such as burning coals, and then form sulfuric acid.

To better understand aerosol formation, scientists need to predict the nucleation rate based on knowledge of the composition of the critical nucleus, Zhang explains.

This knowledge can be obtained by combining theoretical approaches with "measurements of the size and chemical composition of freshly nucleated nanoparticles in the laboratory and in the field," Zhang notes.

Understanding and eventually controlling aerosol formation may help the environment, benefit human health and improve climate prediction, he says.

Provided by Texas A&M University

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