From Atmospheric Chemistry to Science-Policy of Climate Change

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Atmospheric chemistry and chemical kinetics have played a central role in our assessment of the impact of human activities on the Earth's atmosphere. Reaction rate constants measured in the laboratory are among the important parameters required for reliable understanding and modeling of the behavior of the atmosphere under natural as well as under conditions perturbed by human activities. Such an understanding has been crucial for society to take the necessary measures to address challenges such as the degradation of air quality in urban centers and stratospheric ozone depletion. Much remains to be done, however, to properly address climate change, the most serious environmental challenge facing society in the 21st century. The International Panel on Climate Change concluded in 2007 that there is more than 90% probability that human activities are causing the observed changes in the Earth's climate in recent decades.

The average temperature of the Earth's surface has increased so far by about 0.8 degrees Celsius since the Industrial Revolution, and the frequency of extreme weather events such as droughts, floods and intense hurricanes is also increasing. The consensus of informed experts is that the risk of causing dangerous changes to the climate system increases rapidly if the average temperature rises more than two or three degrees Celsius. Society faces an enormous challenge to effectively reduce greenhouse gas emissions to avoid such dangerous interference with the climate system. This goal can only be achieved by taking simultaneously measures such as significantly increasing energy efficiency in the transportation, building, industrial and other sectors, using renewable energy sources such as solar, wind, and geothermal, and possibly developing and using safer nuclear energy power plants. Fossil fuels such as coal and petroleum can continue to be used beyond a transition period of about one or two decades, but only as long as the emitted carbon dioxide is sequestered and stored in underground reservoirs such as saline domes.