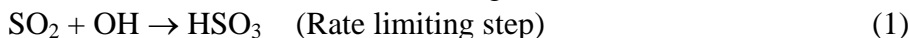


# Atmospheric Aerosol Nucleation

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Nucleation is the source of new particles in the atmosphere. Nucleation is gas-to-particle conversion, in which low volatile gas phase species are converted to aerosol phases. Nucleation starts from the formation of sulfuric acid ( $\text{H}_2\text{SO}_4$ ), because of its low vapor pressure. Formation of  $\text{H}_2\text{SO}_4$  involves the following reactions:



$\text{SO}_2$  is emitted from fossil combustion and also forms from oxidation reactions of the biogenically emitted organic sulfur compounds. OH forms from the following atmospheric reactions:

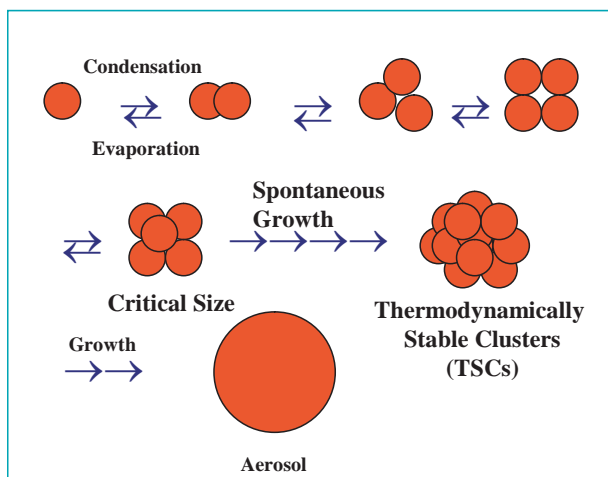


Once formed,  $\text{H}_2\text{SO}_4$  immediately becomes hydrated. The hydrated  $\text{H}_2\text{SO}_4$  molecules are nuclei, and nucleation takes place by condensation of  $\text{H}_2\text{SO}_4$  molecules and coagulation. That is, monomer becomes dimer, and dimer becomes trimer, and so on.



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This cartoon shows this gas phase homogeneous nucleation process.



## References:

Seinfeld, J. H. and S. N. Pandis, *Atmospheric chemistry and physics, from air pollution to climate change*, John Wiley & Sons, Inc., New York, 1997.