



Ice Nucleating Properties of Soot

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Soot is an abundant particle in the Earth's atmosphere. Thus, it has been suggested that soot may provide nuclei for ice cloud formation and therefore influence the planet's climate. The ice nucleating properties of several types of soot with a wide range of physical characteristics have been investigated in the temperature range from 35 to 15°C. Soot particles were placed on a hydrophobic surface within a flow cell in which the water partial pressure and temperature was accurately controlled. Formation of water droplets and ice particles was observed by optical microscopy. Particles of Furnace Black, nHexane and Lamp Black (1-10 μ m in diameter) did not nucleate ice over this temperature range. Lamp Black particles exposed to characteristic atmospheric O₃ exposures also did not nucleate ice. Particles of Channel-Type Black (1-10 μ m in diameter) nucleated ice close to water saturation below -20°C. In all cases it has been shown that clay (Kaolinite) particles of a similar size nucleate ice at a much lower relative humidity. Given that soot particles in the atmosphere tend to be much smaller than in our experiments, our results should be considered as upper limits to the ice nucleation ability of soot. This suggests that deposition nucleation on soot particles at temperatures between -35 and -15°C may not be important in the Earth's atmosphere.