Soot particle Ice Nucleation Ability: Dependence on the Volatile Content

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Soot Particles Exert Radiative Effects via Cloud Interactions

Do soot particles forming ice crystals contribute to cirrus cloud formation? (T < -38 °C) resulting in climate warming?

The ice nucleation ability of soot particles depends on their morphology and surface properties.

Soot aggregates Transmission Electron Microscopy images

Propane flame soot (miniCAST Black) water interaction activities at T = 25 °C
Experimental Design and Soot Samples Investigated

- Soot particle
- Ice crystal

Soot size selection

Thermal denuding in N₂/Air atmosphere at T = 300 °C

Water interaction

Morphology

Chemical content

Particle size and mass

Particle characterization

Volatile mass in soot samples as a function of T °C (Under N₂ atmosphere)
Brown soot (propane fuel-rich) Particles: Property Characterization and Ice Nucleation Abilities

The size and mass of soot particles

Soot-water interaction abilities at T = 25 °C

Soot particle activated fraction (AF) as a function of relative humidity (RH)

- Thermal denuding induced aggregate compaction and wettability enhancement promotes Brown soot (organic rich) homogeneous freezing more easily
Black Soot (propane fuel lean) and Black Carbon Particles: Ice Nucleation Abilities

- Thermal denuding depresses Black soot (organic lean) homogeneous freezing
- Thermal denuding slightly regulates black carbon soot ice nucleation activities
Conclusions

- Thermal denuding modifies soot particle surface wettability
- Results in soot aggregate morphology change
- Impacting soot particles ice nucleation activity