WATER ICE (GRANULAR)

Spherical water ice particles produced in liquid nitrogen

IGEP, TU Braunschweig, Germany

SHORT DESCRIPTION

Granular water ice is produced with contraption that first diffuses small spheres of water in a closed space, then a cold nitrogen gas is injected into the container which has the effect of pushing out the water spheres into liquid nitrogen. This forms a soup of liquid nitrogen and water ice spheres which once dried of the nitrogen forms a snow like material which can be easily handled.The drying of the water ice material has to be done at low temperatures to avoid ice sintering effects. Production should be done in a well ventilated room and in presence of a temperature sensor.

MAIN PROPERTIES

Grain Size (Distribution):	see Figure 2
Purity:	> 99.9%
Material Density:	930 kgm^{-3} (0% porosity)
Tensile strength:	0.9 kPa (50% porosity)
Volatility/Condensability:	see [1]
Thermal Conductivity:	see Fig.6 from [2]
Refractive Index:	see [4]
Electric Permittivity:	3.15 (0% porosity) [3]

REFERENCES

[1] London South Bank University. *Water Phase Diagram*. 2019. URL: http://www1.lsbu.ac.uk/water/water_phase_diagram.html (visited on 09/25/2019).

[2] Lili E. Ehrlich et al. “Large Thermal Conductivity Differences between the Crystalline and Vitrified States of DMSO with Applications to Cryopreservation”. In: *PLOS ONE* 10.5 (May 2015), pp. 1–19. DOI: 10.1371/journal.pone.0125862.

[3] E. Mattei et al. “Dielectric measurements and radar attenuation estimation of ice/basalt sand mixtures as martian Polar Caps analogues”. In: *Icarus* 229 (2014), pp. 428–433. ISSN: 0019-1035. DOI: https://doi.org/10.1016/j.icarus.2013.10.017. URL: http://www.sciencedirect.com/science/article/pii/S0019103513004363.

[4] Stephen G. Warren and Richard E. Brandt. “Optical constants of ice from the ultraviolet to the microwave: A revised compilation”. In: *Journal of Geophysical Research: Atmospheres* 113.D14 (2008). DOI: 10.1029/2007JD009744.

MATERIAL IMAGE

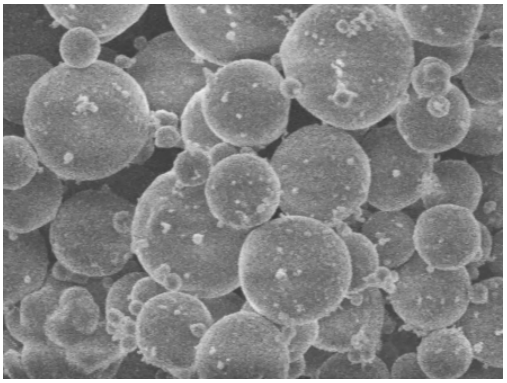

Figure 1: Granular Water Ice

PRODUCTION INFO

Producer	IGEP/TUBS
Production rate	3 kg/12h
Purchase	N/A

PROS & CONS

Cost	●○○○○
Availability	●●●●○
Production time	●●●○○

HAZARDS

Non hazardous substance.

CONTACT PERSON

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