

CO₂ Snow Jet Cleaning

Surface Cleaning Solutions

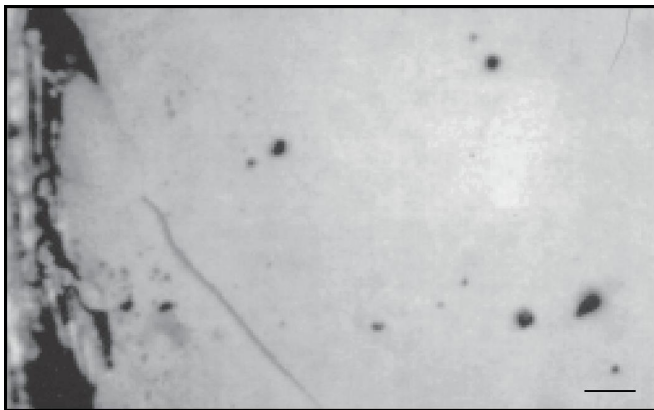
www.co2clean.com

CO₂ Snow Jet cleaning uses a carbon dioxide snow plume to remove particles of all sizes (down to 0.01 microns) and hydrocarbon-based contamination. CO₂ Snow Cleaning is

- **Nondestructive**
- **Nonabrasive**
- **Residue-free**

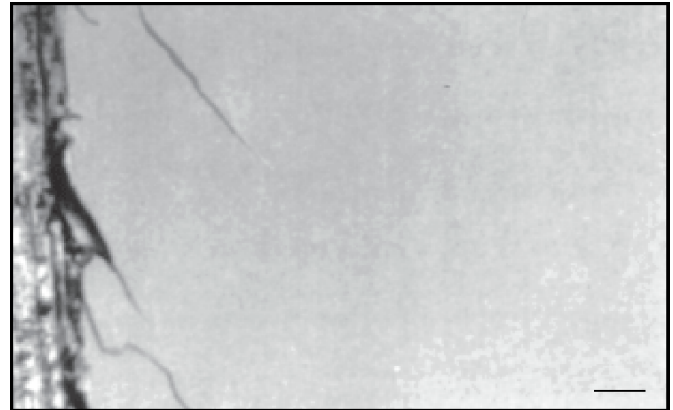
Particle Removal – All Sizes

CO₂ snow cleaning removes particles of all sizes, even inorganic particulates down to and below 10 nanometers (.01 microns). In the example below, we scribed a Si wafer and cleaned it with the CO₂ Snow Jet. Comparison of the same areas before and after cleaning (at 1000x magnification) shows complete particle removal after CO₂ Snow Cleaning. The process works on wafers, optics, metals, and many other materials.



BEFORE CLEANING

10 μ

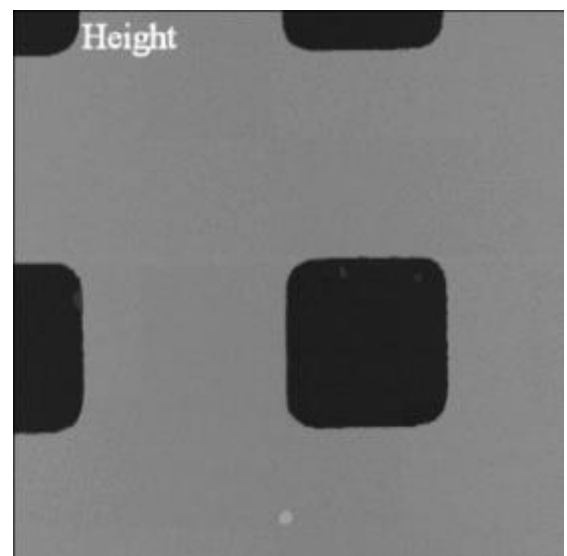
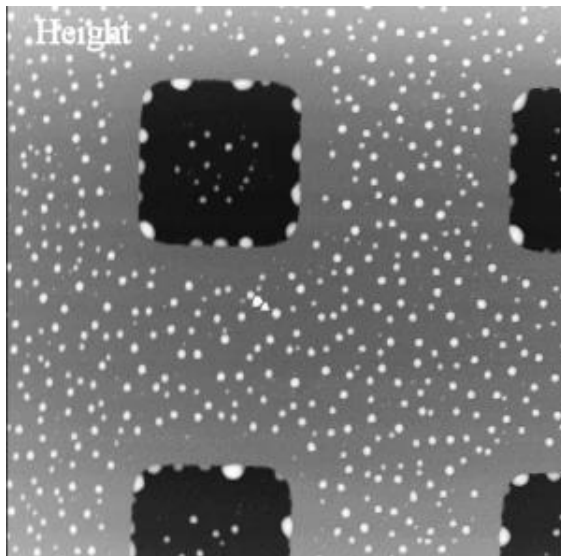


AFTER CLEANING

10 μ

Organic Removal

Here, an AFM step height standard is heavily contaminated with an organic residue. After CO₂ snow cleaning, the surface is restored to pristine condition in both height and phase. Organic deposits as small as 3 nm (.003 microns) were removed. See JVST B28, 643 (2010). Similar results are seen in XPS on other samples and cleaning is as effective as solvents.



Safe, Fast, Effective

Mechanism – cleaning mechanisms for the CO₂ Snow Jet are simple. Expanding either liquid or gaseous CO₂ through a small orifice leads to nucleation of small dry ice particles and a high-speed carrier gas stream. Upon impact with a substrate, the dry ice removes particulates via momentum transfer and organics via a transient solvent process. See www.co2clean.com for details.

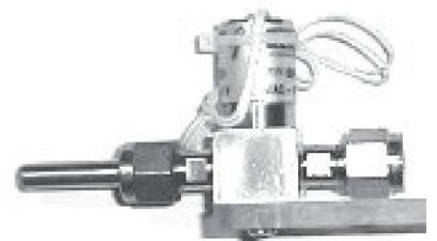
Applications – many different applications have been successfully demonstrated:

- Contamination removal from wafers, metals, polymers, glasses, and ceramic substrates;
- Cleaning optics, i.e., coated lenses, mirrors, lasers, IR and UV optics, fiber optics;
- Cleaning large telescope mirrors;
- Sample preparation before surface analysis (XPS, AES, SIMS);
- Sample preparation for AFM;
- General cleaning applications in laboratories, cleanrooms, and manufacturing;
- Disk drive parts and assemblies;
- Cleaning vacuum system parts, components and systems;
- Art Conservation, soot removal; and
- General substrate preparation and general cleaning.

Equipment – Four different units are offered with prices starting at about \$1800. See www.co2clean.com for more details. The two most popular units are:

Standard Unit - As seen in the left image, these units include a hand-held on/off gun, a PTFE lined stainless steel flexible hose, a CGA320 cylinder fitting, and two nozzles - one stainless and one polymer. An optional pressure gauge and filter are included in the photo.

High Purity Unit - Similar to the standard unit but with an electropolished manual valve (middle) and all compression fittings, or this unit can be equipped with a solenoid (right).



Applied Surface Technologies

15 Hawthorne Drive
New Providence NJ 07974
(908) 464-6675

[email: co2clean@co2clean.com](mailto:co2clean@co2clean.com)

www.co2clean.com

Applied Surface Technologies

www.co2clean.com
(908) 464-6675

email: co2clean@co2clean.com

CO₂ Snow Jet Cleaning

The CO₂ snow cleaning process removes micron and submicron particles (measured from visible down to 0.003 microns) and hydrocarbon-based contamination from surfaces at high efficiencies. CO₂ snow cleaning is nondestructive, nonabrasive, residue-free, and leaves no chemical waste.

Mechanism

Liquid or gaseous CO₂ expansion through a small orifice leads to the nucleation of small dry ice particles carried by a high velocity gas stream. Upon impacting a substrate, the dry ice particles remove the micron and submicron particles via momentum transfer, and hydrocarbons via a transient solvent mechanism or freeze-fracture. The high velocity gas blows the contaminants away.

Applications - Many different cleaning applications have been successfully demonstrated:

- Contamination removal from metals, wafers, ceramics, polymers, and glasses;
- Particle and stain removal from substrates including Si, InP, and GaAs wafers;
- Cleaning optics, i.e., coated lenses, IR, UV and diamond turned optics, fiber optics;
- Telescope mirror and large optics;
- Sample preparation for surface analysis - XPS, Auger, SIMS, and AFM;
- General cleaning in the laboratory, cleanroom, or for manufacturing;
- Cleaning vacuum systems components, X-Ray, and electron and ion optics
- Removing contamination from art, telescope mirrors, and much more

Equipment – Several different units are offered.

Standard Unit - includes a hand-held on/off gun, PTFE-lined stainless steel flexible hose, CO₂ cylinder fitting, NPT fittings, and two stainless steel nozzles: the asymmetric venturi on the unit and a low velocity nozzle.

K1-05 Basic unit with a five foot hose	\$1895
K1-10 Basic unit with a ten foot hose	\$1945

High Purity Units - includes a CO₂ cylinder fitting, PTFE lined stainless steel flexible hose, a stainless steel diaphragm valve, all compression fittings, and two nozzles as above. VCR fittings available too.

K4-05 High Purity unit with manual valve and 5 foot hose	\$1995
K4-10 High Purity unit with manual valve and 10 foot hose	\$2045
K4-10S High Purity unit with solenoid valve, foot switch, and a 10 foot hose	\$2495

Portable Units – A small portable CO₂ cylinder, on/off control, and nozzles

K1-Port	\$1995
K4S-Port	\$2495

Variable Orifice Units - see leak valve option below

Dual Gas Unit - A High Purity Unit is modified to have a dry gas purge flow co-axial to the dry ice stream. Venturi nozzle only. This allows for a dry gas to surround the CO₂ stream

K6-DG10-A – Dual Gas CO ₂ Unit with two solenoids, foot switches	\$3295
K6-DG10-B – Dual Gas CO ₂ Unit with 1 solenoid, one manual valve	\$2895

Large Area Snow Units – For large telescope mirrors, see www.co2clean.com/telescopes

Options

Filters - sintered stainless steel rated at 0.5 microns (F1- \$125), rated at .003 microns (F3 - \$275)

Pressure Gauge PG (0-2000 psi) on TEE attached - K1 units - \$200, K4, or K6 units - \$250

Add-on portable unit to an existing K1 or K4 solenoid - \$995.00

Vacuum Chuck for holding samples (VC) 10 cm x 10 cm \$695.00

Leak Valve option for variable orifice for K1 and K4 units - \$200

Test Units - Test your applications before buying – Call for terms.

Dec 1, 2021

Applied Surface Technologies

15 Hawthorne Drive
New Providence, NJ 07974
Email: co2clean@co2clean.com

(908) 464-6675

www.co2clean.com

Four Different Cleaning CO₂ Snow Jet Units Offered

Applied Surface Technologies manufactures several different CO₂ Snow Cleaning Units. Our goal is to provide maximum options and flexibility. We equip units with the American CGA320, European (International ISO Standard) DIN6, the Japanese JIS22R fittings, or the British BS-8

Standard Units

The K1 units are the simplest and easiest to use. This unit addresses both general and critical cleaning problems. They come with a 5 or 10 foot PTFE lined flexible hose, a CO₂ cylinder fitting, an on/off gun, and two stainless steel nozzles. The nozzle on the unit is an asymmetric venturi and yields small dry ice sizes with high velocities. The second nozzle is a tube nozzle and is geared for gentler applications. Most common options selected are purity filters (F1 or F3) or a pressure gauge (PG). This is the easiest unit to use.

Manual High Purity Units

The K4 High Purity Units are suitable for critical cleaning applications. This unit includes a CO₂ cylinder fitting, PTFE lined flexible hose, an electropolished (3 Ra) stainless steel packless valve, and two nozzles, as described above. All fittings are Swagelok type with a VCR valve option. Similar options as above can be added

Solenoid Operated High Purity Unit

The K4-10S uses a 24 VDC normally closed stainless steel solenoid valve in place of the manual valve and allows for automation and movement. Pressure gauges and filters can be added.

Portable Units

These K4-Port or K4S-Port models allow for easy and lightweight portable CO₂ snow jets. They come with a stainless steel lightweight CO₂ canister and are easy to refill at your site.

Dual Gas System

Two Dual Gas Units, K6-10DG, are available. This model has a special second nozzle that allows a dry gas to surround the CO₂ snow stream allowing for reductions in moisture condensation problem. The Model A has two solenoids (for N₂ and CO₂), hoses, a cylinder fitting, a dual foot pedal for individual control and a 24 VDC power supplies. Model B comes with a manual valve for the dry gas stream. Filters and other options are available.

Telescope Mirror Cleaning Units

These K1-LASU units are a modified K1 unit and allow for particle removal from large surfaces, such as telescope mirrors or any large object. see <http://www.co2clean.com/telescopes>

Other Units

Variable Orifice Units

There is now a leak valve option aimed for both delicate objects and hard to clean surfaces.

Special Nozzles

Custom nozzles are made for situations such as large areas, inner or outer diameters, or other unique geometries.