

Harrick Plasma is a leading supplier of plasma equipment to the research community. We have been providing quality, low-cost, tabletop plasma instruments designed for laboratory, R&D, and small-scale production use for over 30 years.

## PLASMA SURFACE TREATMENT BENEFITS

### Plasma Cleaning

Remove nanoscale contamination  
Enhance adhesion to other surfaces

### Plasma Activation

Render surfaces hydrophilic or hydrophobic  
Prepare surfaces for bonding or deposition

### Plasma Modification

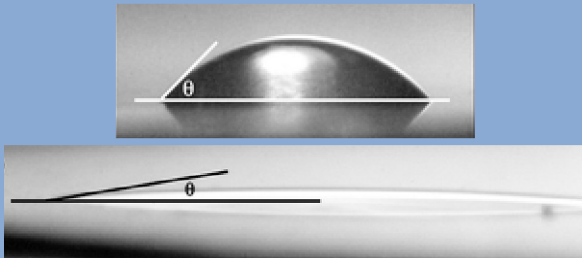
Introduce functional groups on surfaces

### Plasma Sterilization

Remove microbial contaminants

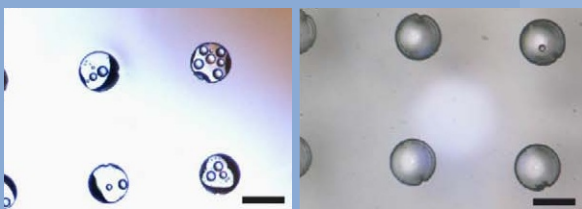
### Plasma Polymerization

Deposit polymers with functional end groups  
Graft polymers onto plasma-activated surfaces



Water contact angle on borosilicate glass. Untreated (top) and plasma-cleaned (bottom).

Source: A. L. Sumner, et al. Phys. Chem. Chem. Phys. (2004) 6: 604. DOI: 10.1039/b308125g. Reproduced by permission of the Royal Society of Chemistry.

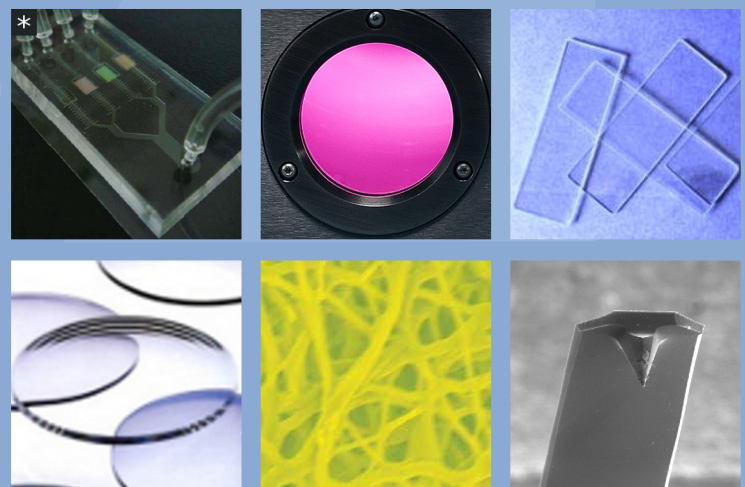


PDMS microwells. Untreated (left): partial filling and bubbles present. O<sub>2</sub> plasma-treated (right): near complete filling and almost no bubbles present. Scale bar: 100 μm

Source: T. R. Sodunke, et al. Biomater. (2007) 28: 4006. DOI:10.1016/j.biomaterials.2007.05.021

## RESEARCH AREAS & INDUSTRIES

Materials Science  
Microfluidic Devices  
Biomaterials  
Dental & Medical Devices  
Electron Microscopy  
Optics & Photonics  
Electronic Packaging  
Sterilization



\* Source: K. W. Kwon et al. Lab Chip (2007) 7: 1461. DOI: 10.1039/b710054j. Reproduced by permission of the Royal Society of Chemistry.

# PLASMA APPLICATIONS

## Surface Cleaning and Surface Treatment

### Benefits

Harrick Plasma Cleaners serve as excellent tools for nanoscale surface cleaning, surface preparation and surface modification. Some benefits of plasma treatment:

- Remove residual organic impurities and weakly bound organic contamination
- Eliminate the use of chemical solvents as well as storage and disposal of solvent waste
- Clean surfaces and change surface properties without affecting the bulk material
- Modify surface chemistry and wettability to tailor surface properties for specific applications
- Promote surface coverage and spreading of coatings on plasma-activated surfaces
- Promote adhesion and enhance bonding to other surfaces
- Treat a wide variety of materials and complex surface geometries, including:
  - Semiconductor, glass, quartz, and oxide-coated substrates
  - Optics and optical fibers
  - Polymers and biomaterials
  - Gold and metal surfaces
  - Electron microscopy (EM) grids
  - Atomic force microscopy (AFM) cantilever tips

### Applications

Our plasma cleaners may be employed in a broad range of surface engineering applications, including areas of materials science, microfluidics, optics, biomedical engineering, and dental research. Some examples of the use of our plasma instruments:

- Clean optics, crystals (quartz, Ge, ZnSe), cuvettes, and substrates used in spectroscopy
- Clean AFM cantilever tips for surface morphology and frictional force measurements
- Activate poly(dimethylsiloxane) (PDMS), glass, and other polymers to irreversibly bond surfaces in microfluidic device fabrication
- Render channel surfaces more hydrophilic to enhance wetting and fluid flow in microfluidic devices
- Pattern surfaces with alternating hydrophilic-hydrophobic regions for self-assembly studies
- Sterilize and remove microbial contaminants on biomaterials and biomedical devices
- Modify surface chemistry of biomaterials to promote proliferation and adhesion of cells and microorganisms
- Restructure polymer surfaces through crosslinking using an Ar plasma
- Deposit polymer layers by plasma polymerization
- Graft functional polymers or end groups onto plasma-activated surfaces
- Modify surface chemistry of fibers to improve adhesion to matrix in fiber-reinforced composites

## PLASMA CLEANERS

Compact table-top units ▪ Inductively coupled plasma ▪ 3 RF power settings ▪ Pyrex or quartz chamber ▪ Valve assembly to control gas flow ▪ Quick setup & easy to use



### Expanded Plasma Cleaner PDC-001/002 (115/230V)

6" diameter x 6.5" length chamber  
Hinged door with magnetic closure and viewing window

Fan cooling

RF Power settings:

Low: 7.2W

Medium: 10.2W

High: 29.6W

Dimensions: 11" H x 18" W x 9" D

Weight: 45 lbs



### Basic Plasma Cleaner PDC-32G/32G-2 (115/230V)

3" diameter x 6.5" length chamber  
Removable front cover for easy access

RF Power settings:

Low: 6.8W

Medium: 10.5W

High: 18W

Dimensions: 8.5" H x 10" W x 8" D

Weight: 13 lbs

## Requirements

Vacuum pump with minimum pump speed of 1.4 m<sup>3</sup>/h (23 L/min) and ultimate total pressure of 200 mTorr or less

Vacuum hose and accessories to connect pump to ½" O.D. plasma chamber outlet

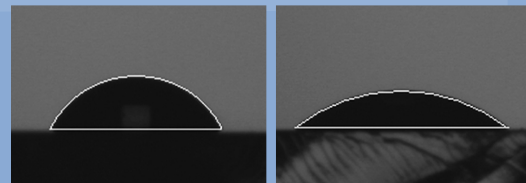
## Available Accessories

PlasmaFlo gas flow mixer

Quartz chamber

Quartz sample tray

Compatible vacuum pumps



Water contact angle on thermoset polyester.  
Untreated (left) and after O<sub>2</sub> plasma (right).

Source: G. S. Fiorini, et al. Anal. Chem. (2004) 76: 4697-4704. DOI: 10.1021/ac0498922

## ACCESSORIES

Optional accessories to use alongside the basic and expanded plasma cleaners

### PlasmaFlo Gas Flow Mixer PDC-FMG/FMG-2 (115/230V)

For fine control of process gas, process gas mixing, and monitoring of chamber pressure

Dual gas inputs

Flowmeter 1: 49 mL/min maximum flowrate \*

Flowmeter 2: 104 mL/min maximum flowrate \*  
±2% full scale accuracy

Thermocouple vacuum gauge and digital meter  
(1 to 1999 mTorr)

Input(s) and Output: 1/4" Swagelok to 1/4" O.D.  
stainless steel hose adaptor

Dimensions: 8.5" H x 10" W x 8" D

Weight: 7 lbs

\* Flowrate for air at 0 psig. Maximum flowrate varies with the process gas and regulated pressure. Correlated flowrates are available for the most common gases used with our Plasma Cleaner (Air, Ar, N<sub>2</sub>, O<sub>2</sub>). Flowrate tables for other gases and regulated pressures can be made available.



### Quartz Sample Tray PDC-00T/32T

Facilitates loading and unloading of small samples and batch processing

PDC-00T: 5.5" W x 6.5" L (Expanded Plasma Cleaner)

PDC-32T: 2.75" W x 6.5" L (Basic Plasma Cleaner)



### Quartz Chambers PDC-00Q/00Q

Replacement for standard Pyrex chamber

More stable material for long-term use

Beneficial for processes that require extremely clean processing conditions



## VACUUM PUMPS

Suitable for use with either the Expanded or Basic Plasma Cleaner

Includes vacuum hose, hose clamps, and hose adaptor to connect plasma chamber to pump inlet

### Standard Vacuum Pumps

Rotary vane pumps

Uses standard hydrocarbon pump oil

Suitable for pumping nonreactive gases (e.g. air, N<sub>2</sub>, or Ar)

	PDC-VP/VP-2 (115/230V)	PDC-VPE/VPE-2 (115/230V)
Pumping Speed (50/60 Hz)	Higher reliability 3.2/3.6 m <sup>3</sup> /hr	Lower cost 5.1 m <sup>3</sup> /hr
Ultimate Total Pressure (gas ballast closed)	1.5 mTorr	7.5 mTorr
Ultimate Total Pressure (gas ballast open)	23 mTorr	150 mTorr
Motor Power (50/60 Hz)	250/300 W	373 W
Dimensions	9" H x 15" W x 5" D	9.75" H x 14" W x 5.5" D
Weight	34 lbs	27 lbs
Replacement Pump Oil	PDC-VP-OIL	PDC-VPE-OIL

### Oxygen Service Pumps

Suitable for concentrated oxygen and nonreactive gases (e.g. air, N<sub>2</sub>, or Ar)

No hydrocarbon oil used (the combination of concentrated oxygen and hydrocarbon oil is an explosion hazard)

	PDC-OPF/OPF-2 (115/230V)	PDC-OPD/OPD-2 (115/230V)
Pumping Speed (50/60 Hz)	Rotary vane pump; uses Fomblin fluid 3.3/3.9 m <sup>3</sup> /hr	Dry scroll pump; uses no oil or fluid 4.8/6 m <sup>3</sup> /hr
Ultimate Total Pressure (gas ballast closed; 50/60 Hz)	1.5 mTorr	53/45 mTorr
Ultimate Total Pressure (gas ballast open; 50/60 Hz)	90 mTorr	263/225 mTorr
Motor Power (50/60 Hz)	250/300 W	250/300 W
Dimensions	9" H x 17" W x 6.5" D	11.5" H x 17" W x 10" D
Weight	48 lbs	51 lbs
Replacement Fomblin Fluid	PDC-FMB	n/a