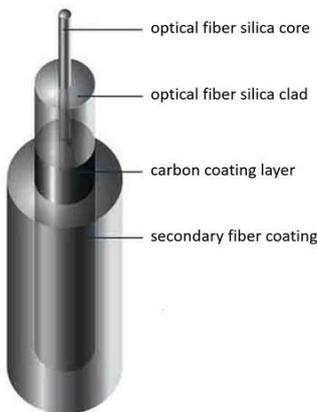


BIMESPRO & PLASIL Hermetic Fiber Coating Application Systems

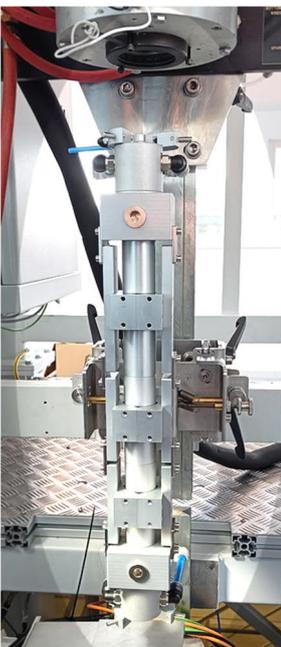


Introduction & Application

The advantage of hermetically coated over polymer-coated optical fibers is well-known, as it increases static fatigue resistance of optical fibers and provides a barrier layer against penetration of hydrogen (and other) ions even at elevated temperatures. Hermetically coated fibers are ideal for use in extreme environments with hydrogen atmosphere (low or high pressure) and very high/cryogenic temperatures.

Bimes and Plasil MCA metal- and CCA carbon coating application systems are installed in special fiber draw towers for fabrication of different types of optical fibers used in high temperature, geothermal, oil, aerospace, biomedical and defense fields.

CCA Carbon coating applicator system



Thin carbon layer is applied to fiber surface during drawing, below the draw furnace, where the retained heat of fiber can drive a chemical vapor deposition reaction (CVD) of carbon particles to glass surface.

An excellent hermetic coating for an optical fiber is attained in the reactor by decomposition of suitable organic gas at the fiber surface. A gas like acetylene or benzene decomposes at the fiber surface and a strongly adherent carbonaceous coating is produced, essentially impermeable to water and hydrogen. Such coating does not degrade optical properties while improving fiber static strength. Optimum conditions for carbon coating application are defined by thermal conditions, thus by fiber diameter and temperature, or, in other words, by line speed, reactor length and distance between draw furnace and reactor, for a specific product. Very thin carbon layers need further mechanical protection; therefore another coating has to be applied to the fiber later in the draw line (acrylate or high temperature resistant polymer).

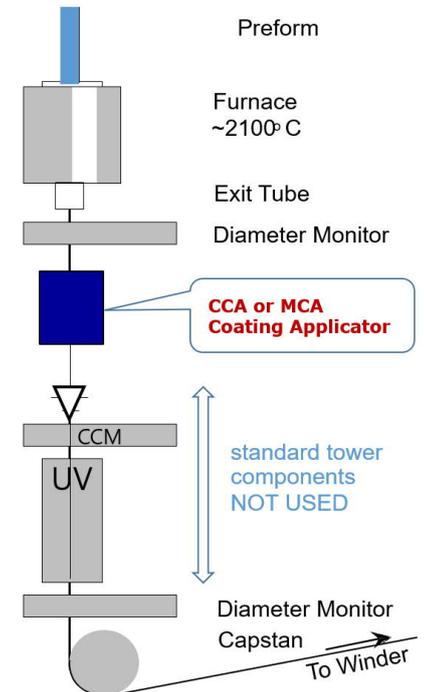
CCA Description

CCA carbon application system consists of the following components:

- cylindrical carbon reactor, with gas stripping irises at the top and at the bottom,
- gas panel and/or liquid source vaporizer, for delivery of gas mixtures to reactor,
- exhaust connection to scrubber,
- brackets for installation into fiber draw line,
- electrical control cabinet with process controls and interface to draw tower control system.

CCA Options

- MGT mini gas scrubber adapted to CCA use
- fiber temperature sensor at the entry to reactor (or any other position in the draw tower),
- re-heating consolidation furnace at the bottom of the reactor,
- reactor heater, with PID controlled temperature control,
- bracket with option to slide CCA furnace out of the draw line (repeatable position).

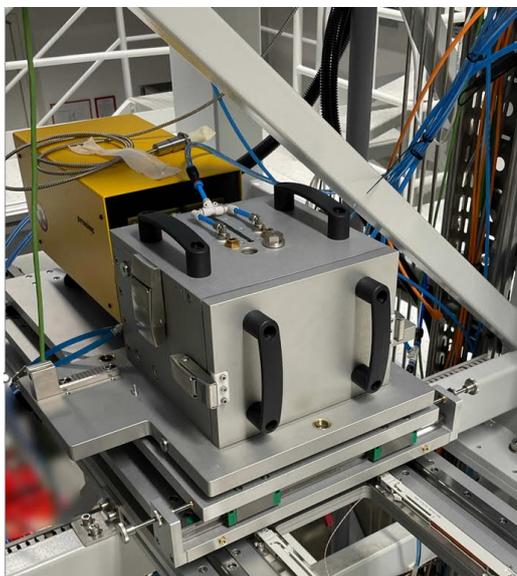
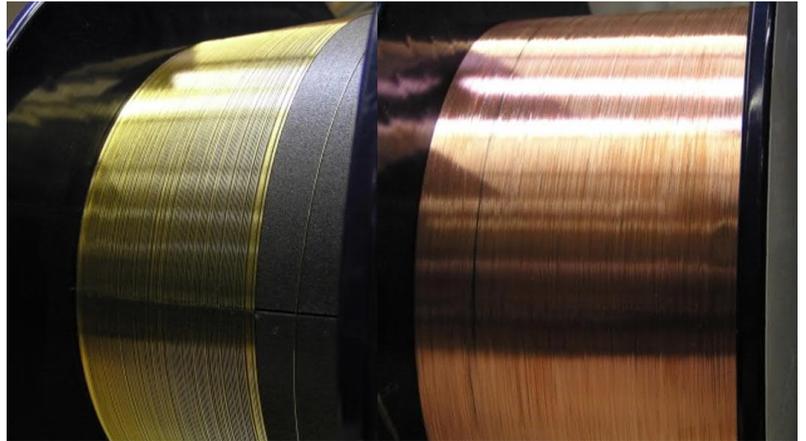


CCA Specifications:

Parameter	Value
Size	500 x 200 x 200 (HxWxD) in mm
Materials	Stainless steel, ceramic insulation, fused silica tube
Electrical power	Max 2 kW, 230V 50 Hz, 10A fuse
Effective length	Adjustable 200 – 400 mm
Reaction gas	Aliphatic hydrocarbons
Exhaust	DN25 duct connection

MCA Carbon coating applicator system

Metal coating application is a process where metal layer is frozen onto fiber surface while hot fiber is passing through metal melt. To be able to achieve metal adhesion to fiber surface, all process parameters must be kept within very tight tolerances to obtain properly formed and stable coating layer. Parameters influencing metal coating application are metal melt temperature, hydrostatic melt pressure, fiber guiding die shape and size, fiber temperature at entry to melt, bare fiber diameter and draw line speed. Metal layers on optical fibers achieve thickness of 15 – 25 μm and provide hermetical and temperature insensitive coating for harsh environmental conditions, including cryogenic and vacuum applications.



MCA Description

MCA metal application system consists of the following components:

- melt coating furnace:
 - with metal furnace body and inductor coil,
 - furnace inner parts with melt crucible and fiber guiding die, made of high purity graphite,
 - furnace insulation by graphite felt and non-woven ceramic fibers,
 - accessories for installation in fiber line on a draw tower
- induction power supply with output stage transformer and capacitor bank (Jutronic),
- electrical control cabinet with connecting cables (common to CCA and MCA devices), with interface to draw tower control system,
- panel for MCA furnace protection gas (Ar or N₂) and cooling water

The melt crucible is of a special construction, which allows drawing very long fibers without re-filling during the process. MCA applicator system was developed to ensure stable and repeatable process conditions of low-loss, high strength optical fibers.

MCA Specifications:

Parameter	Value
Approximate size	OD 200 mm, height 240 mm
Total applicator weight	max. 14 kg
Insulation materials	silica woven felt, graphite, rigid graphite felt
Heating principle	by induction
Temperature range	400 – 1200 °C, $\pm 1^\circ\text{C}$ by PID
Protective gas:	Max 20 slm argon, 1/4" fitting, 2 ports
Temperature sensor	R- or W type thermocouple
Metals applied:	gold, copper
Charge size	sufficient for >4 km for 125 μm fibers (continuous draw)

MCA Options

- pyrometer for melt temperature (added to thermocouple)
- different crucible size and fiber guide die options
- aluminum coating application
- bracket with option to slide MCA furnace out of the draw line (repeatable position)

For more information and quotes please write to sales@bimespro.com or info@bimespro.com