BIMESPRO HTS high-temperature doping system

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Introduction

HTS is an add-on system to Bimes MDS preform fabrication processes, using MCVD technology. It was developed to provide high dopant vapor flow for fabrication of preforms with large diameter metal- and rare earth doped cores. HTS is used in fabrication of RE-doped optical fiber preforms for all types and versions of fiber lasers. HTS is a source of high temperature precursor vapors, providing dopants like Al, Yb, Tm, Er, Nd, Sm, and Ce (as well as others) to MCVD (and other) deposition process. Precursors used in HTS are inorganic or organometallic powders.

HTS system provides controllable, stable, and repeatable delivery of vapor to MCVD deposition process for all types of active fibers. HTS is the only system that can provide deposition conditions for large core preforms, improving active fiber homogeneity and draw length. With proper combination of dopants, processes using Bimes MDS and HTS can consistently produce low NA large core optical fiber designs. Bimes MDS preform fabrication systems, combined with OptiFACT control system, are designed for optimum performance of HTS doping during active preform fabrication process. When used with Bimes FCVD systems, active preform process can be optimized for fast collapse and minimal influence of collapsing condition on preform index profile.

Applications

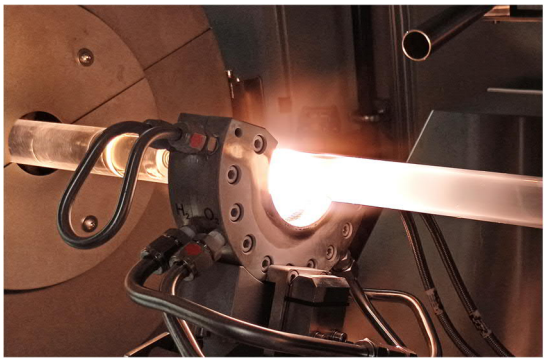
HTS process is the key technology for fabrication of active preforms for rare earth-doped laser optical fibers. HTS system is ideally suited for vapor-phase core layer doping as compared to solution doping or aerosol methods for fabrication of laser fibers. HTS technology has been proven in industrial environment by several global laser suppliers, who are able to produce large core, high power laser fibers with different designs and specifications. Bimes pro can provide training for customers who are not familiar with vapor phase doping processes.

Description

HTS high temperature doping system is installed inside of a special purpose cabinet, which is divided into several sections: electrical cabinet, low temperature gas panel, high temperature gas panel, hot chamber with sublimators, and delivery tube assembly including oil circulating system. Whole HTS cabinet is mounted on a high precision motorized slide, permitting exact and repeatable insertion of the HTS vapor delivery tube through the special rotary seal into substrate tube. After preform is made, the whole HTS cabinet slides back for free access to the rotary seal and inlet tube for maintenance.

Sublimators are electrically heated and allow loading with large volume of precursor material, for fabrication of several preforms in a series, without the need to replenish them or open them to the atmosphere. Internal design enables high evaporation rate and proper vapor saturation of carrier gas over a wide temperature range. Sublimator gas and vapor ports are equipped by high-temperature shut-off valves, which are closed for sublimator removal and installation. Sublimators have to be replenished in inert atmosphere, to prevent oxidation and humidity ingress into

precursor powders. All critical parts of piping, sublimator and delivery tube are made of rust-free alloys, preventing contamination by transition metal ions for optimal laser fiber background loss in aluminosilicate- and aluminophosphosilicate glasses.
Delivery tube and related components are oil heated over the whole length, including the tip and section protruding into preform substrate tube. Fast oil circulation ensures very low temperature variation over the whole length and ability to compensate changing thermal conditions at the tip.

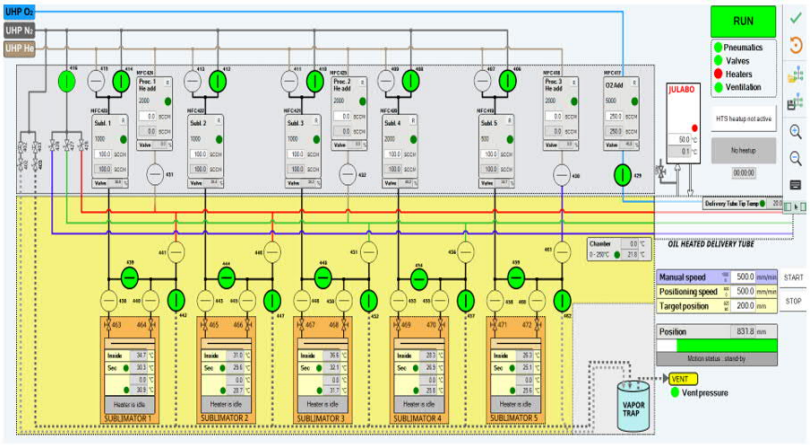


Dopants and precursors

HTS in standard configuration provides 5 sublimators for up to 5 precursor materials. Metal ion precursors for aluminum are either AlCl3 anhydrous powder or Al-acetylcetonate. For doping with Yb, Er, Tm, Ho and other rare earth-ions, organometallic (β–diketonate) powders are used (usually chelates or acetylacetonates). Bimes pro provide or recommend a source of high-purity raw materials, suitable for repeated use in HTS sublimators.

Control system

Control system and software is one of the key components in MCVD laser fiber preform fabrication process. HTS systems are controlled by OptiFACT system and software, offering advanced vapor phase doping functions, extensive data logging, process data analyzer, recipe database, as well as remote update and servicing. Control system is usually installed as part of the conencted MCVD system, on request it can be provided as a stand-alone version.



Specifications

Parameter	Value
Cabinet size	1000 x 1500 x 1700
Cabinet material	Steel, dust painted RAL 7035
No. of sublimators	3, 4 or 5
Piping material	Ni-alloy and stainless steel 316EL
Purge gas	UHP nitrogen: max 20 slm, 2-5 bar
Carrier gas	UHP helium: max 20 slm, 2-5 bar
Reaction gas	UHP oxygen, max 5 slm, 2-5 bar
Temperature range	100 – 250°C
Temperature stability from set temperature	sublimators ±?°C delivery tube ±2°C
Gas flow control	Digital MFC Bronkhorst
Exhaust	DN 50 to MCVD scrubber
Hot vapor valves	proprietary high temperature design

Accessories and options

- Spare extra delivery tubes
- MDS preform fabrication system options
- MIF MCVD collapsing furnace (for MDS)
- Raw materials

Services:

- consulting services for MCVD and HTS installation and laboratory design
- HTS and MCVD process training for standard and special doping methods and preforms
- Equipment start-up services

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