Authors: Tiberius Brastaviceanu, Francois Bergeron add your name here

Device for single fiber wet silver coating

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This document describes **single optical fiber coating with silver by wet chemical deposition** and the device associated with this process. Only the tip of the fiber is coated.

Intent: build a device for single optical fiber coating that can be sold or used to provide fiber coating services.

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History

This concept was proposed by Tibi, based on ideas generated during wet silver optical fiber coating experiments. See document describing the experiments (members only).
The process was developed by Francois and Tibi. Jonathan got involved in this project with the development of the Mosquito used for feedback and automatic control of the process.

General description

This process/device can be used to coat small surfaces, up to 2 mm in diameter. It is capable of coating single optical fibers, or small bundles of fibers reaching up to 2 mm in diameter.

 First published on September 15, 2011
Last Modified on June 22, 2011. Please keep us updated if you use this protocol and make improvements.
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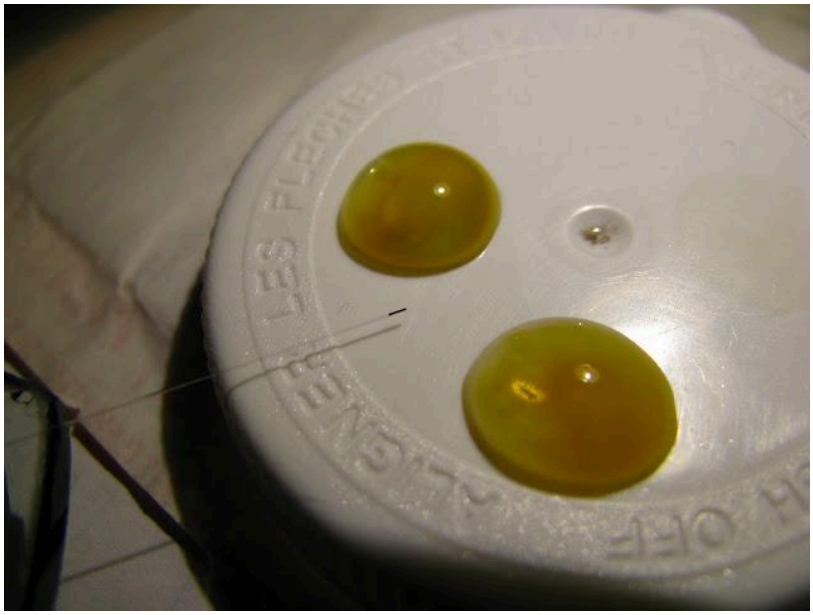
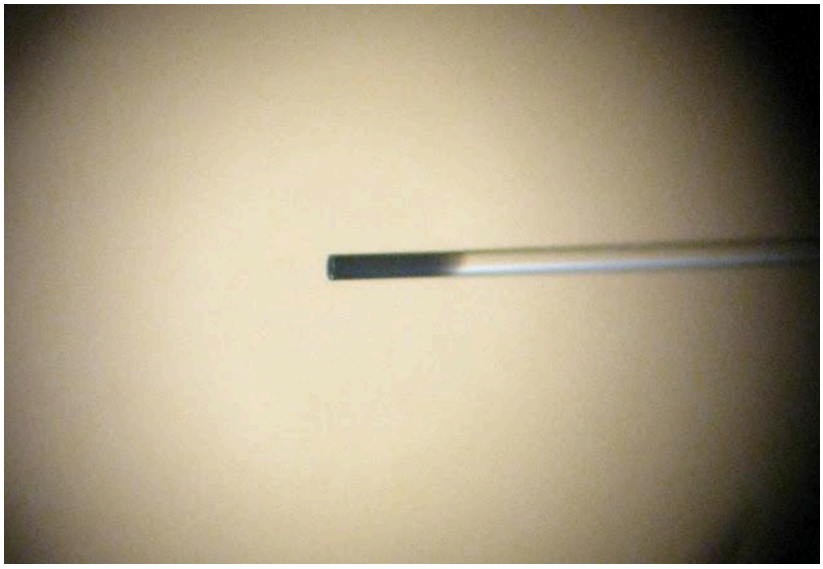
The coating process is chemical deposition of silver atoms and nanoparticles, in a water-based solution. It is performed at room temperature, in a very small volume of solutions, at low concentrations and very low precipitation rates.

The process is designed for coating the tip of the fiber, although it can be very easily adapted for coating the entire length of the fiber. It was successfully tested on glass and PMMA.The coating is only a few nm thick.

100 um diameter glass fiber after coating in 2 steps.
The two drops are the 2 coating environments.



The same fiber under a 20X microscope.



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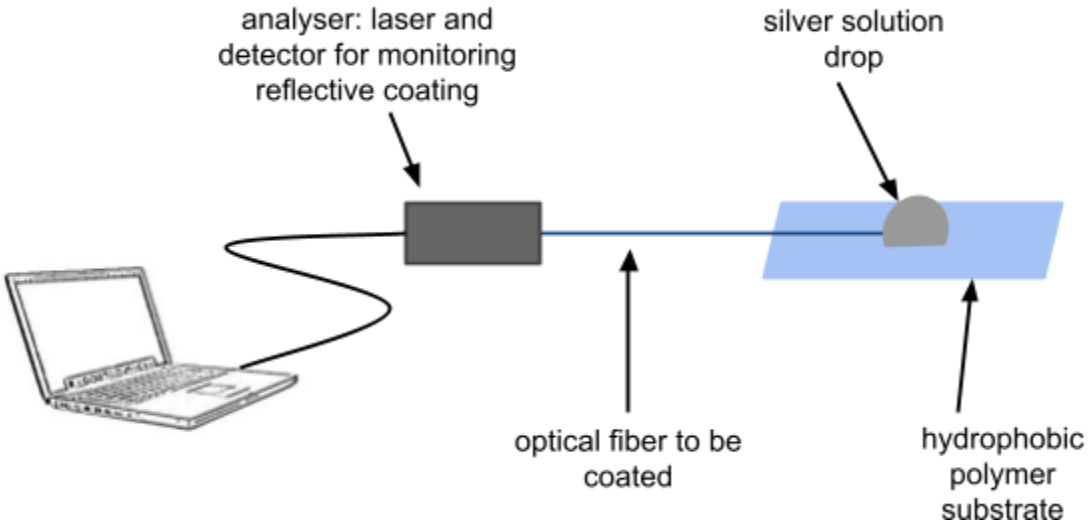
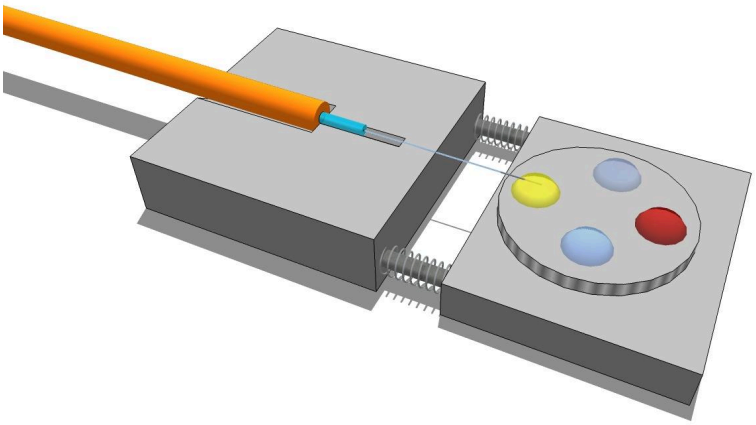
Drawings

General layout of the device



Concept of device - design underway...



Description of the process

Optical fiber preparation

Here we describe coating of the tip of the fiber.

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The optical fiber is stripped and cleaved.
The tip of the fiber might need to be polished or shaped.

Surface preparation

The surface to be coated must be treated before coating, first by roughly cleaning the fiber tip with ethanol, dipping in acid, rinsing with pure water, treating with a wetting agent and after with a diluted solution of tin.

Coating process

The coating process must be performed at at low concentration and very slow precipitation rates in order to obtain a good quality mirror . It can be done in 2 or even 3 steps in order to avoid deposition of large silver particles.

Drop mixing device

The wet/chemical coating is performed within a small volume of solutions, within a drop. In order to have a good mix of solutions the drop is agitated with sound See pictures on Picasa.

Feedback

The coating process is monitored in real time in order to precisely control the thickness of the silver layer. See pictures on Picasa

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