Date: 07 March 2012

In attendance: Tibi and Jonathan
Location: Tibi's
Topic: first iteration for the constriction transducer.

See pictures taken documenting this Work.

ATTENTION: to understand the language of this document you may need to refer to these documents.

Contents

Main Goal

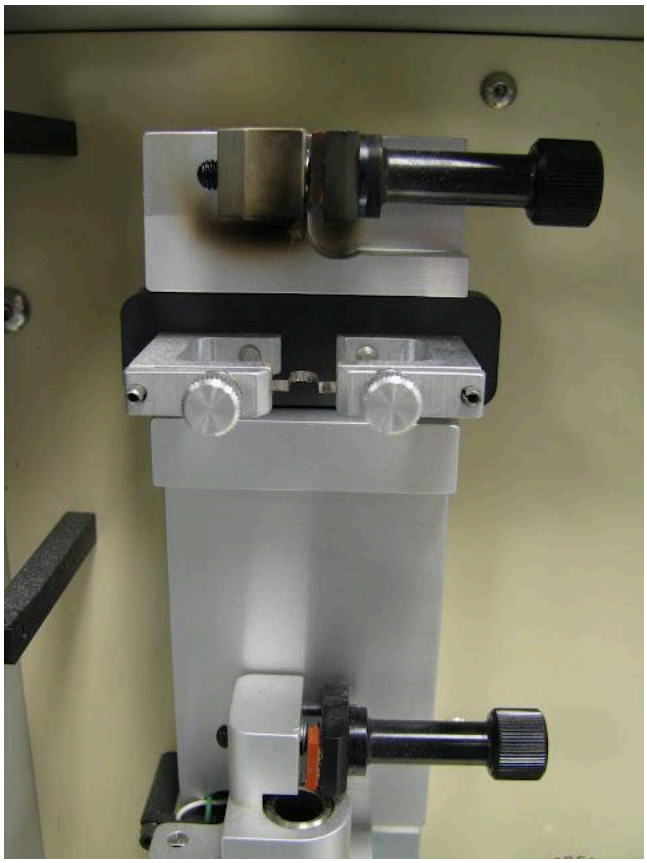
Try to manufacture a constriction transducer using the Infinicor300 62.5um core glass fiber, using tungsten and Nickel-Chromium
See this article for inspiration on the constriction transducer.
Go to this project's page.

Summary of results

See pictures taken documenting this Work.
We tried two types of heating elements, tungsten and chrome-nickel. Both wires form crystals when they are heated and end up burning before the glass fiber softens enough to be pulled.

We are looking into a new heating element, a **platinum alloy**, used in glass pipette pullers, ex. the one used by Dilson Rassier. Platinum rhodium alloy (click to buy) is used to create the heating elements. The picture below shows the pipette glass puller from Dilson's lab. On the top part of the machine we can see a the U-shaped heating element (a foil).

Below, a closer look at the U-shaped heating element. The two black screws are used to fix the glass pipette on top and on the bottom. Gravity pulls the pipette down as it softens. The heating element becomes white during the process.

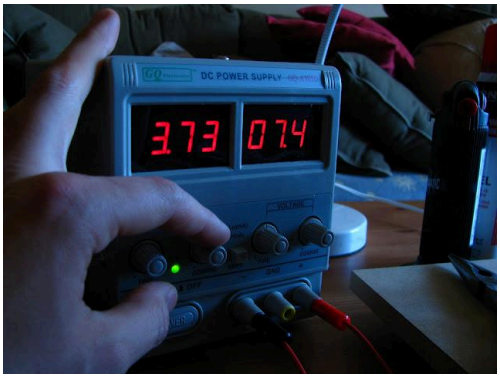
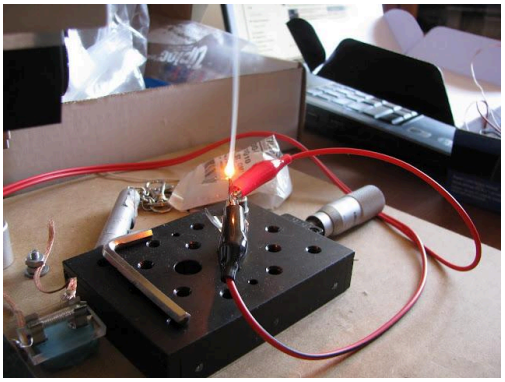


Materials

Heating elements

Tungsten filament from a 50W halogen bulb Flood Light from Globe	
Tungsten filament from a 12V 50W halogen bulb from Electro	
NI80/CR20 from Omega Engineering Inc., part: [NI80-010-50]	

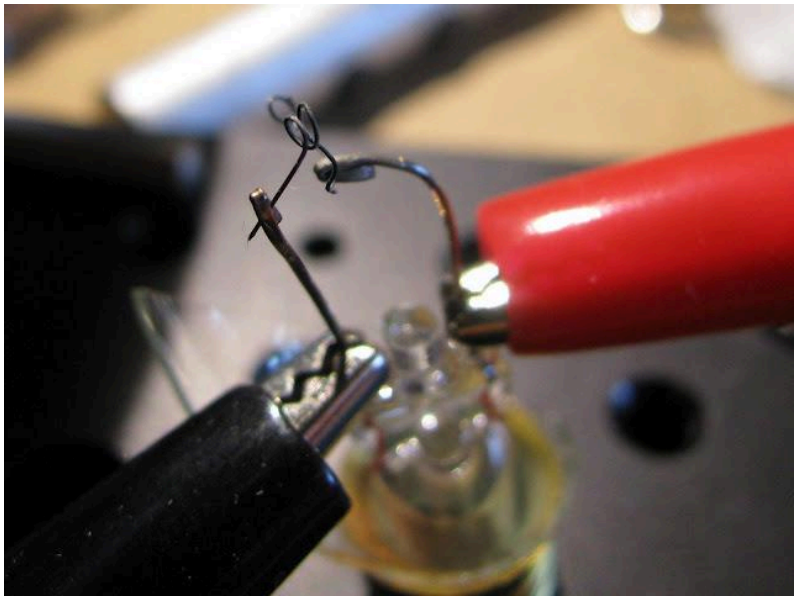
Others

Power supply	
Micrometers	
[Infinicor300 62.5um core](#) glass fiber	

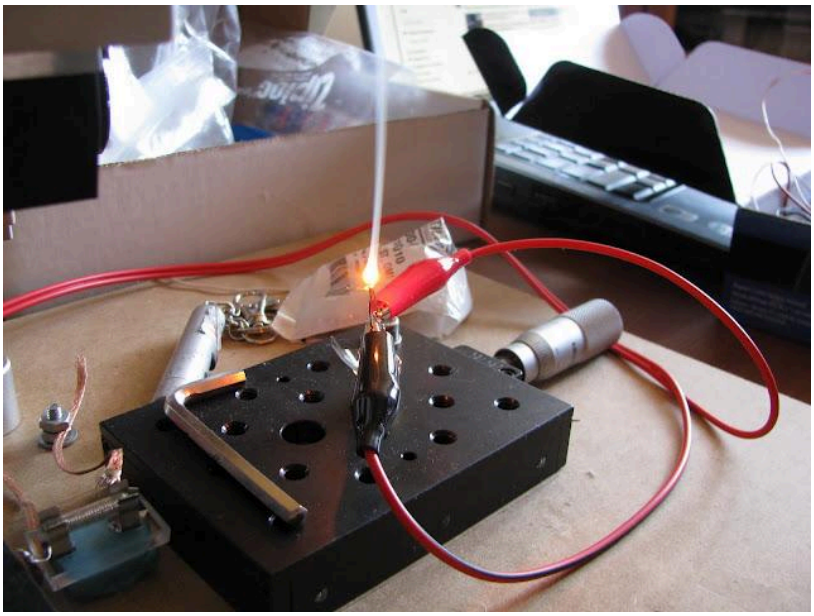
Results and conclusions

First trial

Used a tungsten filament from a 50W halogen bulb Flood Light from Globe.
The filament was attached to the remaining of a broken bulb, to 2 alligators clamps, and to the power supply.

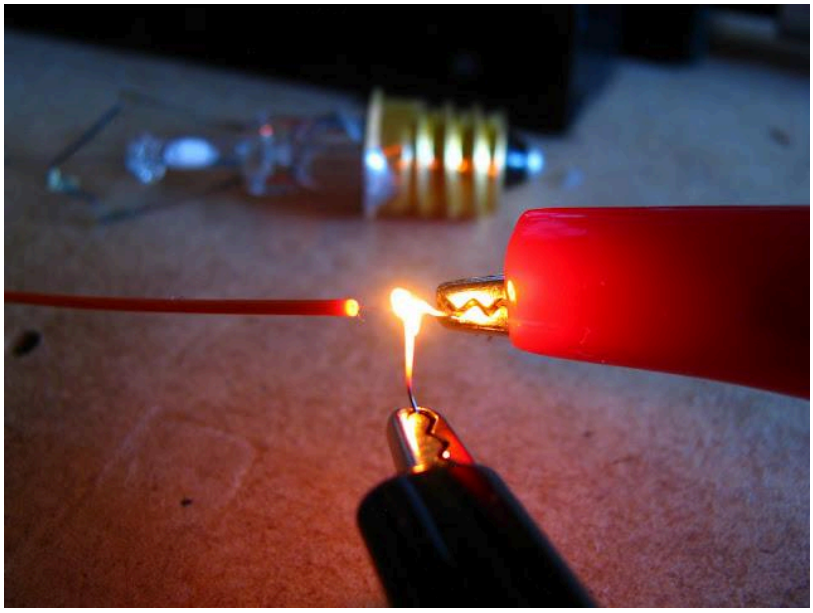


We put over 40W into the wire until it burned.



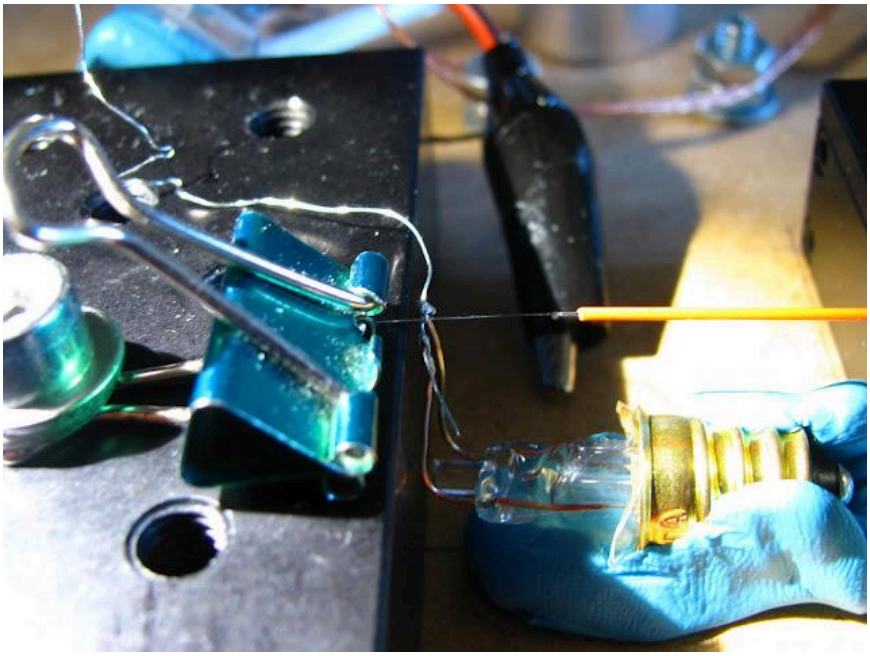
Second trial

Used NI80/CR20 from Omega Engineering Inc., part: NI80-010-50. We made a loop and put the glass fiber through it. The fiber bent under its own weight while heated. It was touching the NiCr wire. The wire burnt. This wire melts at around 1148ºC. The glass melts above 1400ºC.



Third trial

Same as the second, but this time we placed the optical fiber on the micrometers and tried to pull it. The fiber was clamped on one side (see pic below) and glued with putty on the other side.

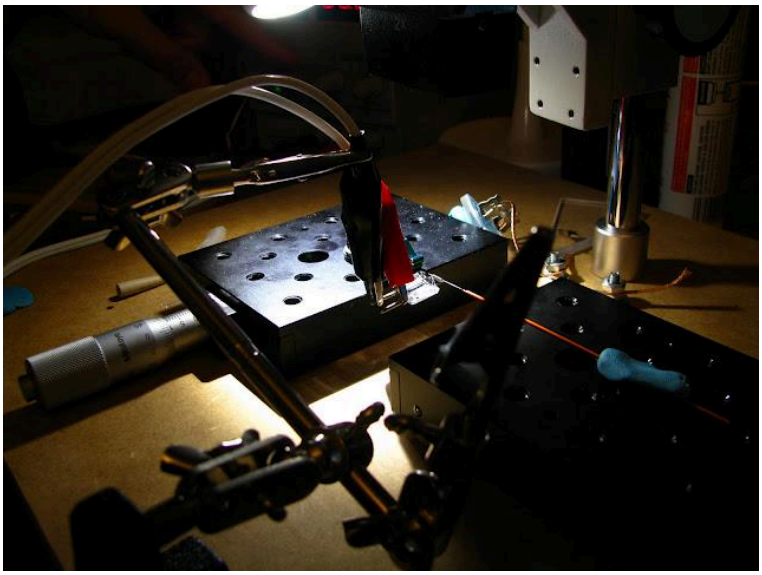


Under microscope, the fiber going through the small NiCr loop.

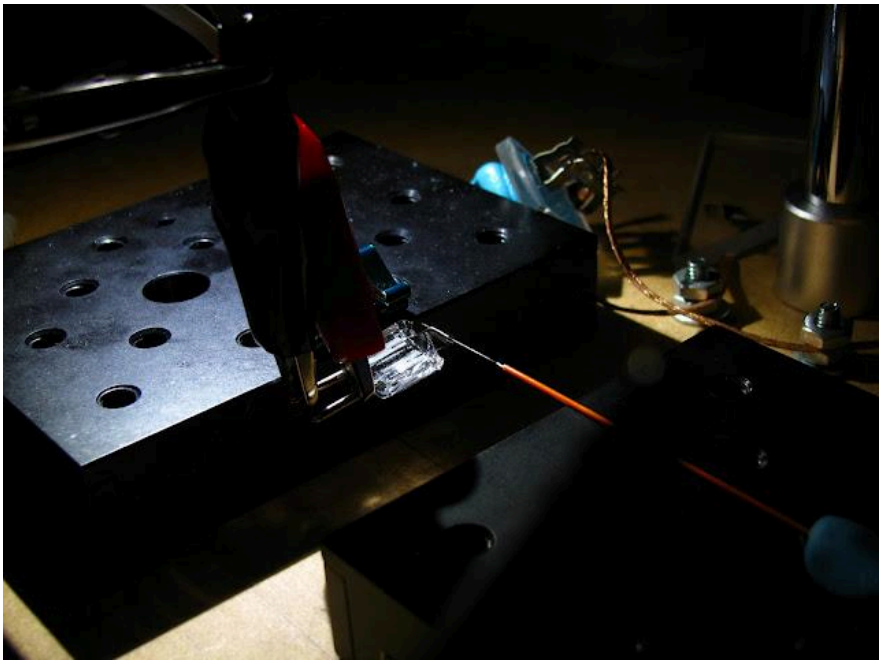
This attempt was unsuccessful. We were not capable of softening the glass enough to pull it, before the wire burned.

Fourth attempt

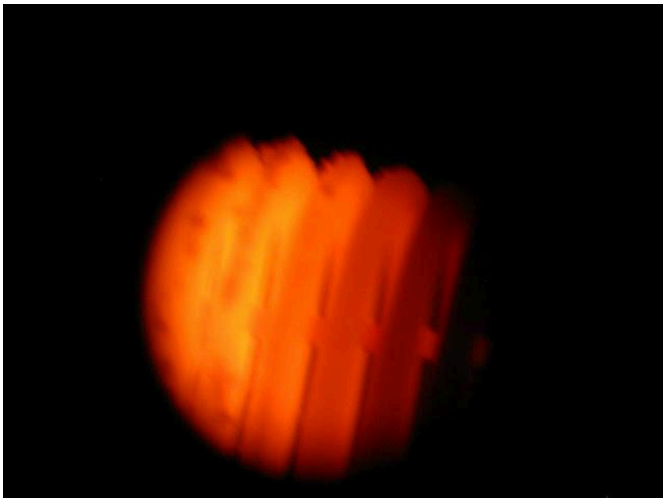
We went back to tungsten, using a filament/coil from a 12V 50W halogen bulb from Electro. This time we decided to use the entire filament. We also improved the setup, adding a metallic articulated holder.



In the pic bellow you can see the fiber going through the tungsten coil.

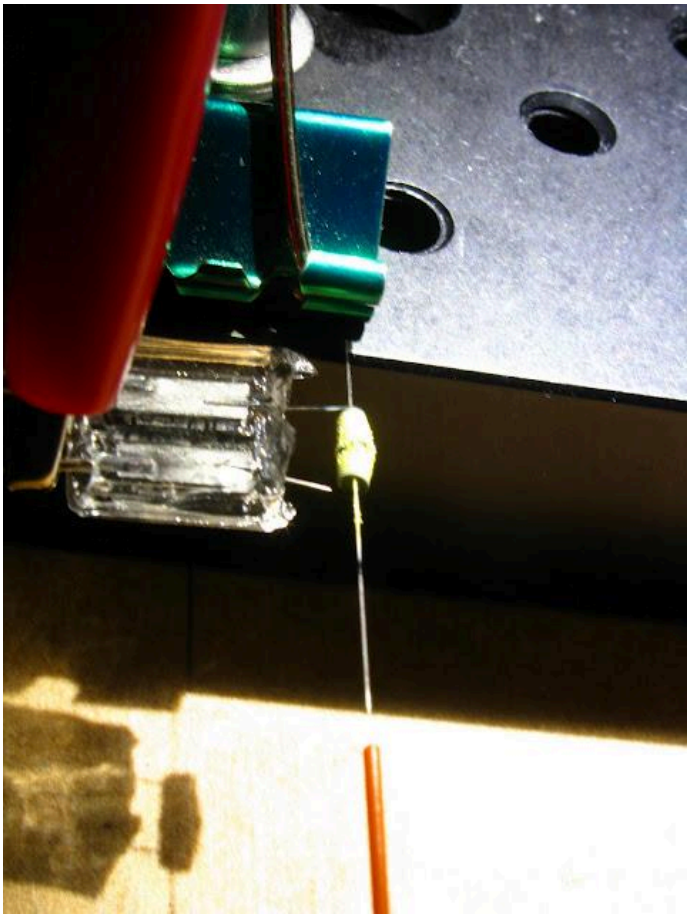


We sent over 40W into the coil. The pic below shows the fiber through the red hot coil.

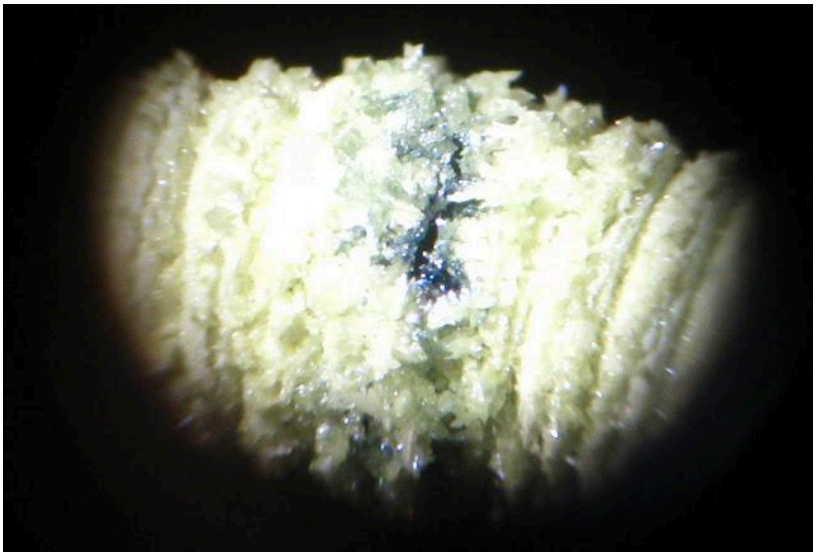


The red-heated coil started forming crystals on its surface. Similar crystals were projected onto the optical fiber as well. The fiber never got soft enough to be pulled before the coil degraded and burned/melted.

The pic below shows the coil after the experiment with covered with crystals.



A closer look at the crystal formation under the microscope.
Real color is yellow and a little green



What’s Next

Two things are needed:

1. A better way to clamp down the fiber for pulling.
2. A reliable method to heat the glass fiber.

Some options where discussed for holding down the fiber for pulling. Simplest seems to be a metal surface with some strong magnets to hold the fiber in place. Another possibility is v-groove and a clamp.
The tungsten foil used in Dilson Rassier lab is the best solution, it is a consumable and needs to be ordered. Otherwise a flame will need to be precisely controlled to heat the glass.

Other documents

- See this article for inspiration on the constriction transducer.