Using Carbostar Carbon Fiber Electrodes

General handling. Our electrodes are made of 7µm carbon fibers using borosilicate glass as an insulating layer. The tip is very delicate and easy to damage, so take great care when handling these electrodes. Never touch the tip with your finger or with anything else.

Filling iontophoresis barrels. Iontophoresis micropipettes can be filled through a PE-10 tubing attached to a small-gauge syringe needle. Keep the electrode's tip in distilled water or physiological saline while filling. These micropipettes are self-filling through an internal glass filament located in them. Therefore, inject only a small drop of your solution into the free end of the pipette, and let the capillary force do the rest. Wait for 5 to 10 minutes until the solution goes down into the tip. Dye solutions such as 2% pontamine sky blue in 0.1M Na-acetate may take as long as 20 or 30 minutes. ***Your patience will pay off !*** Finally, fill up the rest of the pipette to the desired level. If there is a bubble or two in the pipette, tap the electrode gently with your fingernail. Do not be too anxious to get rid of all of the bubbles. They do not necessarily block the iontophoresis current.
Alternative method. If you prefer you can fill in your solution into the micropipette after finding and identifing your neuron. With a steady hand and the aforementioned PE-10 tubing this is possible. Again, be very patient during filling and allow at least 5 minutes for complete filling and equilibration.

Tissue penetration. *Dura mater* and connective tissues have to be removed from the site of penetration. To avoid mechanical damage to the tip, the electrode must penetrate the tissue with relatively little effort!

Storage and reusability. If the electrode's tip remains undamaged during the experiment, you can save it for another experiment. However, the tip must be kept in distilled water or physiological saline all the time; if it dries the forming microcrystals may destroy the tip's structure. Use a small beaker partly filled with water or saline and attach the electrode onto its wall using a blob of modeling clay (plasticine). Store in a refrigerator. The major obstacle of reusing carbon fiber electrodes is the tissue debris/slime that adhere to it in the tissue.

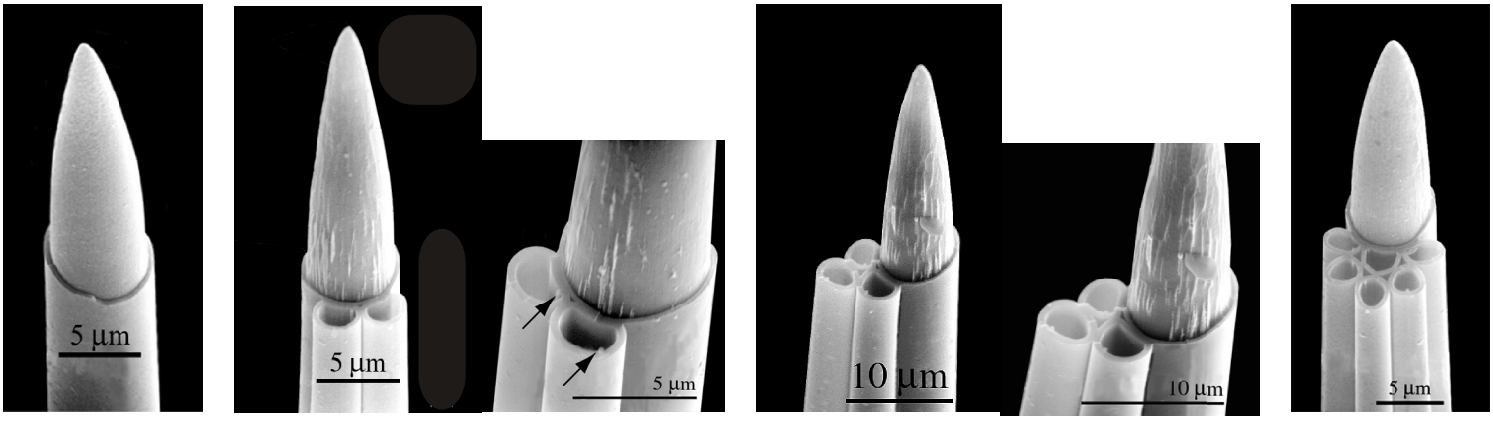
Cleaning/rejuvenating carbon fiber electrodes. Before repeated usage, the carbon tip of the electrode should be cleaned/rejuvenated. This can be done by passing -2µA through the carbon fiber electrode for 2 to 3 minutes in physiological saline (adjust pH to 10 by NaOH) using platinum wire as counterelectrode. *Our BAB-501 iontophoresis pump is recommended for this procedure.*

Visual observation of the tip. Attach the electrode onto a glass slide used in light microscopy by a blob of modeling clay. Place the slide under the microscope for observation. Do not forget to keep the air exposure of a filled electrode as short as possible!

Physical properties of carbon fiber

	SI	English
Tensile Strength	3,800 Mpa	500 ksi
Tensile Modulus	231 GPa	31.5 Msi
Ultimate Elongation	1.64%	1.59%
Density	1.8 g/cm^3	0.065lb/in^3
Cross-Sectional Area	3.3 x 10^{-5} mm^2	6.5 x 10^{-8} in^2
Diameter	6-7 µm	0.28 x 10^{-3} in
Electrical Resistivity	1,670 µΩ-cm	
Specific Heat at RT	921 J/kg/°K	
pH (distilled water)	Neutral	

Carbostar-1 **Carbostar-3** **Carbostar-4** **Carbostar-7S**



Arrows show the inner filaments that allow self-filling.

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