

## Microelectrode, carbon No. 04-00014

Thank you for choosing a Sensolytics carbon fiber microelectrode.

The carbon fiber (diameter 7-9  $\mu\text{m}$ ) is sealed in soda-lime glass and is exposed at the very end of the electrode tip. The protruding end of the fiber is isolated by electrodeposition paint.

### Preparation

Prior to its use, the carbon fiber needs to be cleaned. Cut the very end of the carbon fiber perpendicular to its axis in order to expose a fresh disk-shaped electrode surface. We recommend the use of an optical microscope and a sharp blade for this step (please refer also to our corresponding information sheet for further details on the cut procedure).

The actual size of the exposed carbon surface needs to be characterized by means of cyclic voltammetry using a free-diffusing, reversible redox mediator. The diffusion-limited current  $i_{\infty}$  corresponds to the radius of the electrode and the size of the electrode surface is calculated via the following equation:

$$i_{\infty} = 4 n F D c r$$

$n$  = number of transferred electrons,  $F$  = Faraday's constant,  $D$  = diffusion coefficient of the redox species,  $c$  = bulk concentration of the redox species,  $r$  = radius of the electrode [cm]\*

The copper wire is covered with an insulating polymer. The insulation is removed at the very end of the wire. *Please use only this part* for connection with the potentiostat. In order to clean the copper connection, use a rough emery paper. Please pay attention to hold the electrode at the copper wire and not at the glass body to avoid traction to the connection between copper wire and carbon fiber while cleaning the contact.

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\* Please refer also to e.g. Bard, A. J.; Mirkin, M. V. *Scanning electrochemical microscopy*, 2<sup>nd</sup> ed.; CRC Press: Boca Raton, Florida, 2012, p 3 for further information.

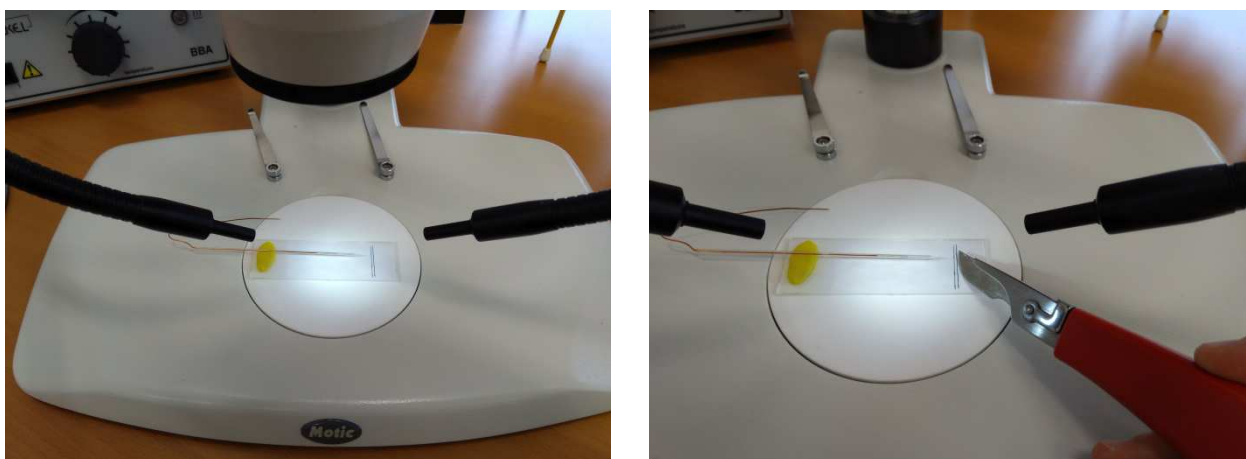
## How to Cut Carbon Microelectrodes

The following instruction explains the procedure to cut carbon microelectrodes to achieve a clean electrode surface.

### *Preparations:*

- We recommend to use an optical microscope
- Standard microscope glass slide, small piece of modeling clay, sharp blade

For carbon microelectrodes a carbon fiber is sealed in a protecting glass body and only exposed at the very end of the electrode tip. The protruding end of the fiber is isolated by electrodeposition paint and a disk-shaped electrode apex is achieved by cutting the electrode perpendicular to its axis. These electrodes are likewise cut to achieve a clean electrode surface. Use a standard microscope glass slide and modeling clay to fix the corresponding carbon microelectrode like shown in the following images. *Please note: The marks on the glass slide are a guide to the eye between the photographs of the single cutting steps (figure 1) and the images taken by the optical microscope displayed in figure 2.*



*Figure 1: Photographs of the cutting procedure. After fixation of the electrode a sharp blade is used to cut the very end of the protruding carbon fiber perpendicular to its axis.*



*Figure 2: Microscope images of the cutting procedure. Only the very end of the fiber is removed to achieve a fresh electrode surface.*

The surface quality and the actual size of the exposed carbon surface needs to be characterized again after cutting by means of cyclic voltammetry using a free-diffusing, reversible redox mediator.