Glassy Carbon Electrode Information

Product Testing and Materials Disclaimer

Important information about Pine Research Instrumentation glassy carbon electrodes. Please review this information prior to use. Contact Pine with any questions.

1. Material Source Disclaimer

Standard glassy carbon (GC) electrodes from Pine Research Instrumentation are fabricated using glassy carbon obtained from HTW Hochtemperatur-Werkstoffe GmbH in Germany. GC is a difficult material to manufacture in a consistent manner, but Pine Research Instrumentation has found GC rods from this source to be quite reliable and high in quality and reproducibility (see: http://www.htw-germany.com/).

When a GC rod is manufactured, the possibility always exists that the composition may not be entirely uniform over the entire length of the rod. There may be differences in the microstructure of the material, and there may be small void spaces within the rod. Thus, the surface characteristics and/or area of an electrode made from such a rod may change over time, as each polishing of the electrode surface reveals a new layer of material with potentially differing properties.

The voltammetric behavior of a GC electrode is also known to change depending upon the treatment received by the electrode surface prior to use. In general, most GC electrodes from Pine Research Instrumentation are shipped with a mirror polish finish achieved by using sub-micron alumina powder (other finishes available upon request). Given that there exists a wide body of literature and lore describing various procedures, rituals, and recipes for "activating" the surface of a GC electrode, some researchers may opt to further prepare the surface of a GC electrode prior to use.

Pine Research Instrumentation recognizes that in some electrochemical applications, a researcher may require more control over the material used to manufacture a GC electrode. In these situations, Pine Research Instrumentation is usually able to fabricate custom electrodes from material supplied by the researcher. Contact Pine Research Instrumentation for further details.

Info:

In light of the discussion above, Pine Research Instrumentation makes no warranty, express or implied, regarding the surface characteristics, surface chemistry, or surface morphology of glassy carbon electrodes.

2. Product Use Warning

Researchers are warned that glassy carbon electrodes should not be used at highly oxidative potentials for long periods of time (for example, $+2\,V$ in $1.0\,M\,H_2SO_4$ for days) as this may permanently and irreversibly damage the glassy carbon. Electrodes damaged in the manner described here cannot typically be repaired nor their surface regenerated through traditional polishing methods.

Caution:

Do not use glassy carbon electrodes at highly oxidative potentials for long periods of time, as this will irreversibly damage them.

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3. Glassy Carbon Electrode Manufacturing Evaluation

Pine routinely evaluates every permanent (fixed disk) glassy carbon electrode as part of the manufacturing process. Only those that pass our electrochemical and visual inspections are sold to customers. The cyclic voltammogram obtained using the electrode is examined, and features such as the current magnitude, peak current and position, zero current crossover, and capacitive hysteresis are evaluated. This evaluation assures that there is no solution leakage around the shroud/electrode interface. Visual inspection assures that any surface defects observed are within typical limits for commercially available GC rod.

3.1 Electrochemical Testing

A cyclic voltammogram that is free of redox peaks is desired for a typical glassy carbon electrode (see: Figure 1). A copy of this test is provided with the purchase of all permanent (fixed disk) glassy carbon electrodes.

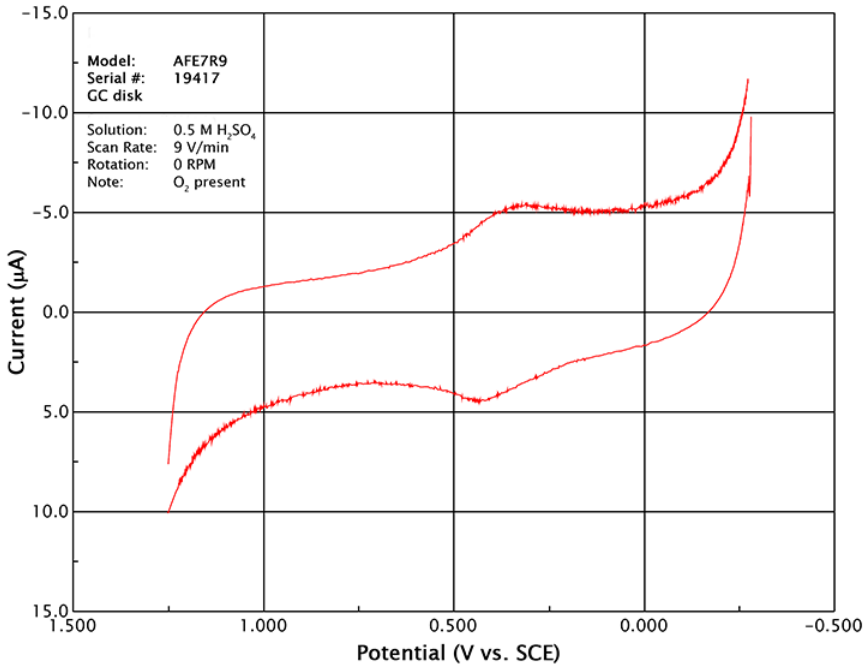

Figure 1. Glassy Carbon Electrode Cyclic Voltammogram Test.

3.2 Visual Inspection

Typical $5\ mm$ OD GC electrode surfaces show < 10 defects when viewed under $25\times$ magnification (see: Figure 2).

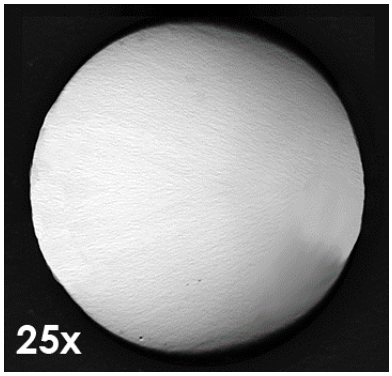

Figure 2. Glassy Carbon Surface Magnification.