

Supplemental Material

A Portable Spark-Induced Breakdown Spectroscopic (SIBS) Instrument and its Analytical Performance

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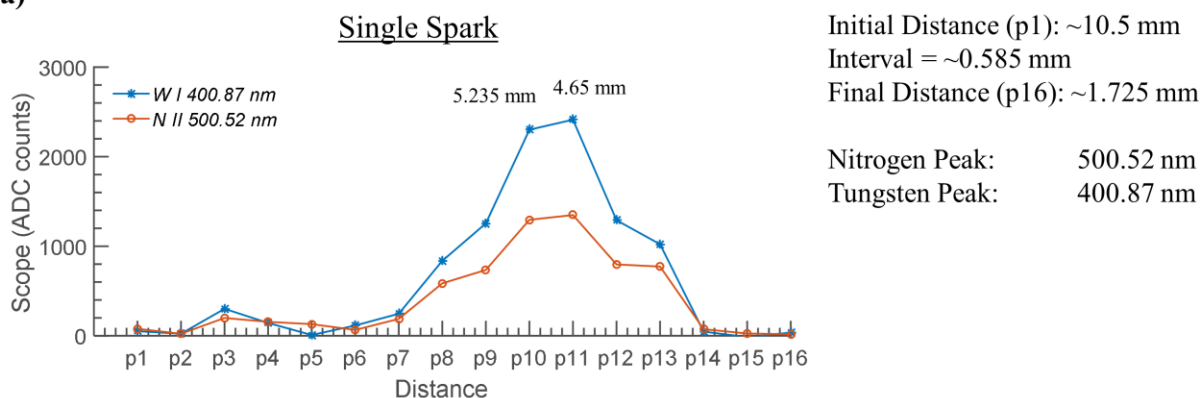
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(a)



(b)

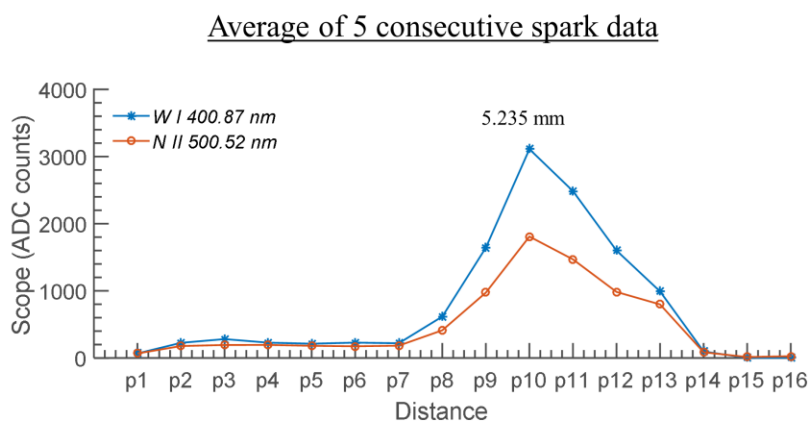


Fig. S1. The variation of nitrogen and tungsten peak intensities with respect to the distance between two electrodes. P1 is the initial point where the gap is the furthest. The interval for each point is about 0.585 mm. (a) is single spark plot that each data point represents the peak intensity obtained from single spark measurement method, using only one spark per sample, and (b) is plotted based on the average data of five consecutive sparks.

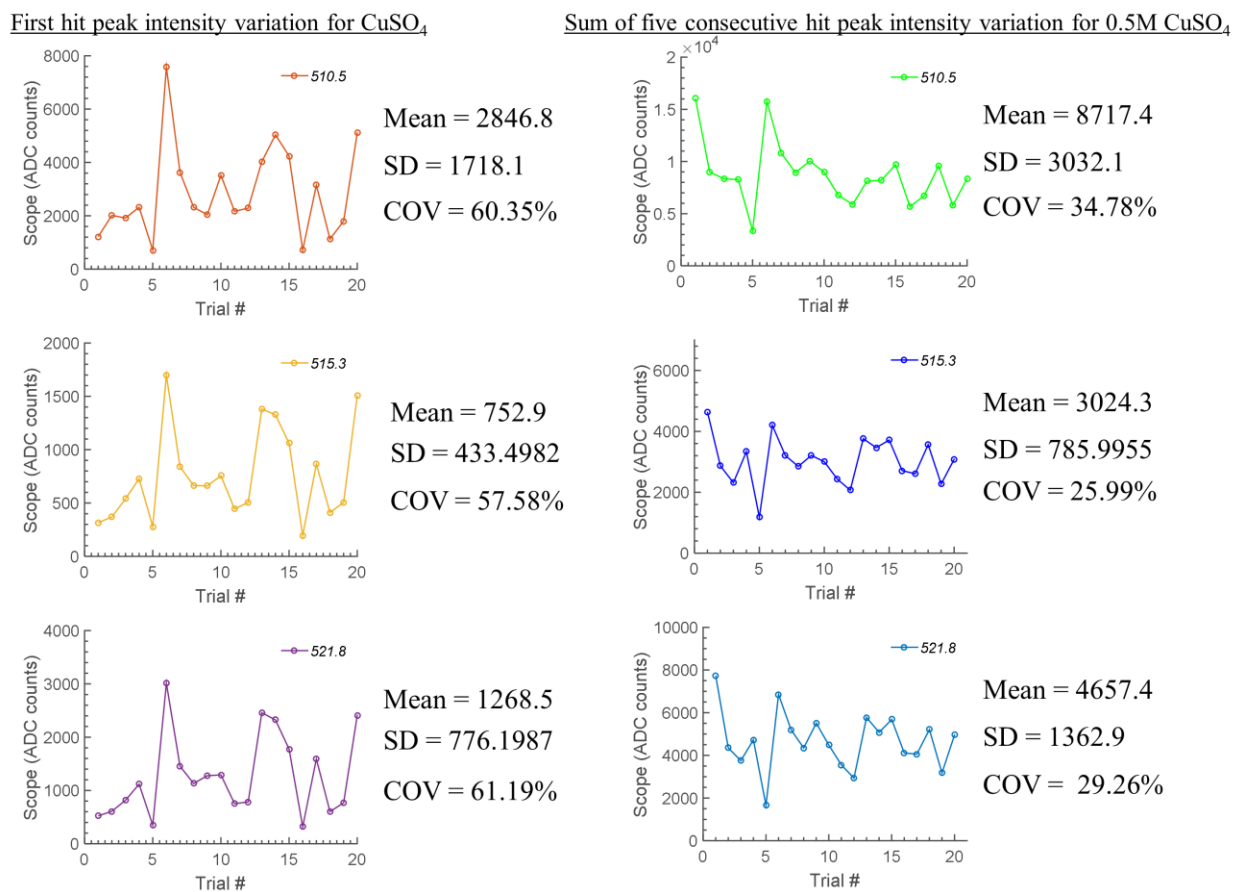


Fig. S2. The comparison between single spark measurement and multiple spark measurement. The left column represents the peak signal variation in 20 repetitive single spark measurement. The right column is the result of variations in multiple spark measurement. Each data point in multiple spark measurement indicates sum of five consecutive spark at same location of sample.

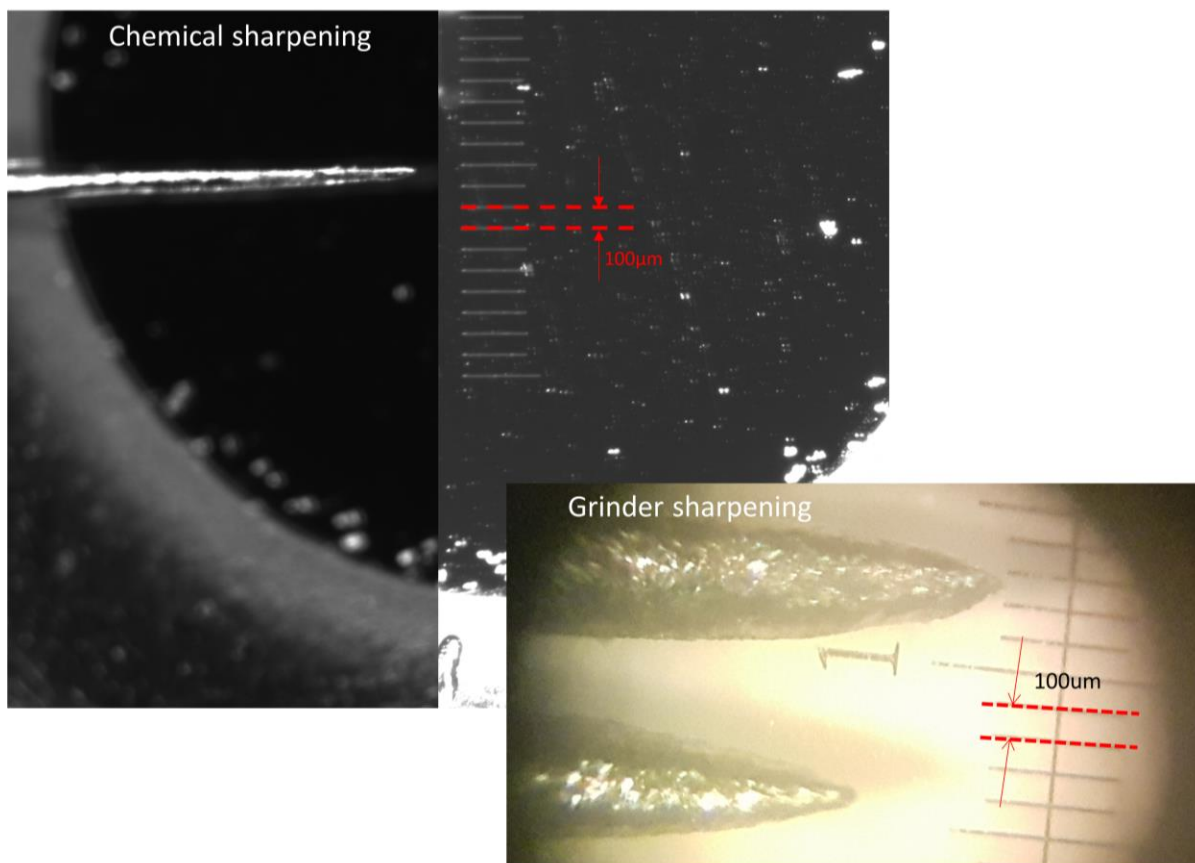


Fig. S3. Comparison between the effectiveness of chemical and grinder sharpening of a tungsten electrode. The chemical sharpening methods has clearer and sharper result.

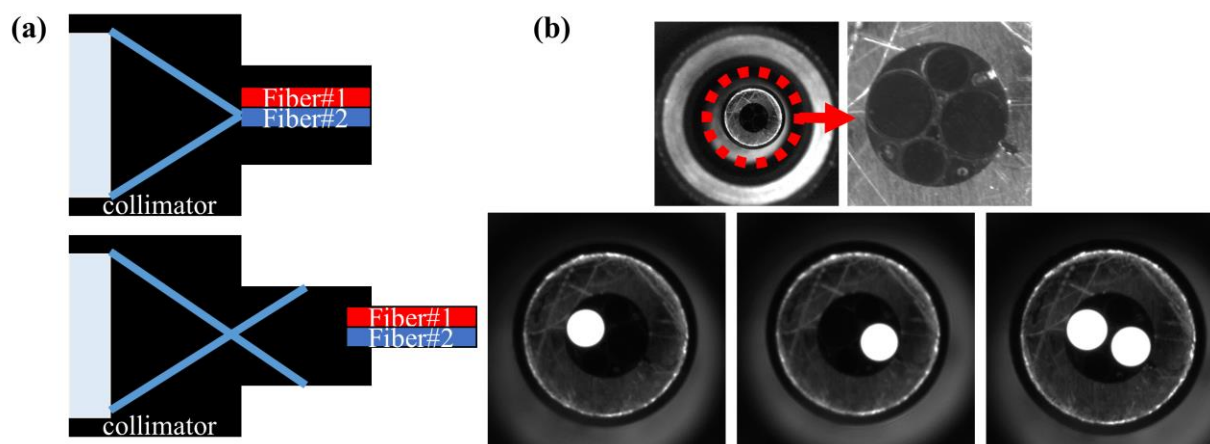


Fig. S4. (a) A bifurcated optical fiber contains two cores which are separated to be attached on each spectrometer. Therefore, in order to achieve balanced signal intensity, the optical fiber is moved away from the lens to overfill the both of cores. (b) is stereomicroscope images of the input of bifurcated optical fiber. It clearly shows that there are two cores in the fiber, and these can be illuminated separately.

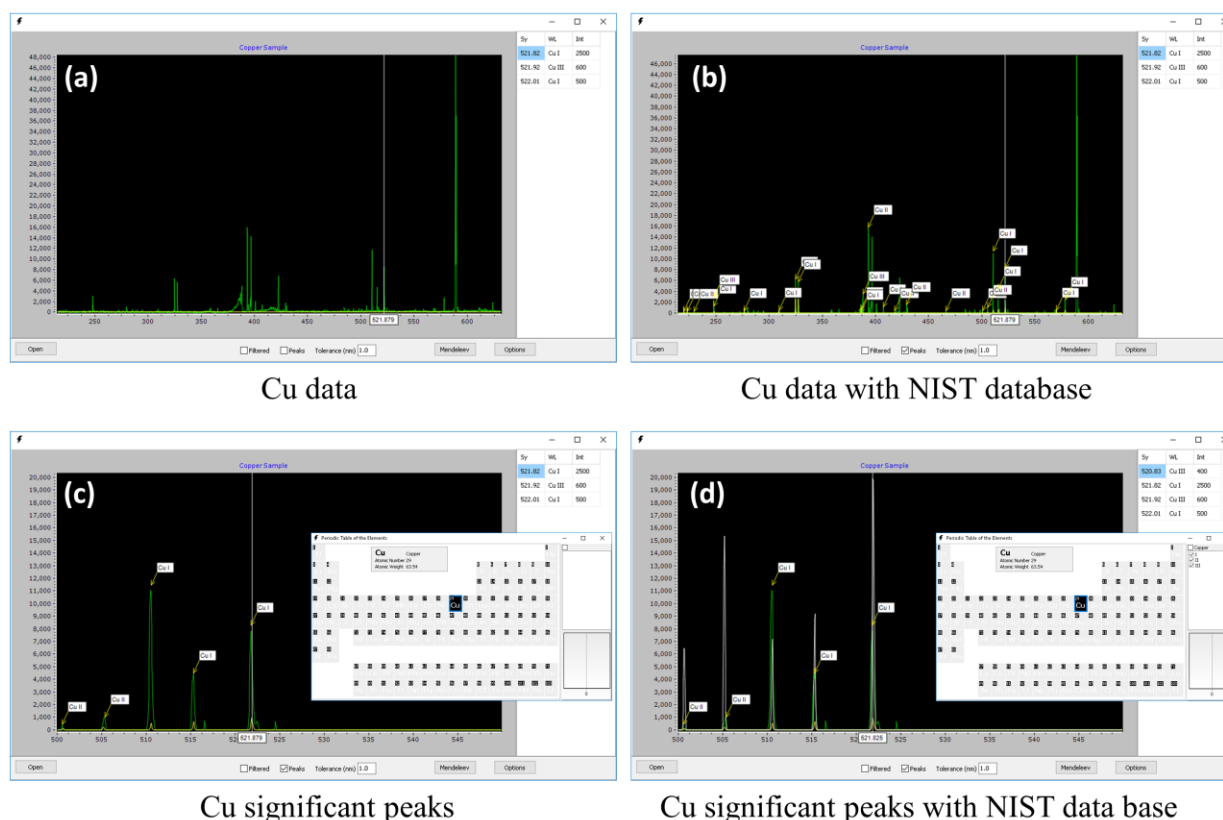


Fig. S5. This represents the custom developed analysis tool which allows user to compare the experimentally measured spectra to the reference data retrieved from NIST database. (a) shows experimentally measured copper data on the analysis tool. The spectral response signal is defined in green color. The spectrum is raw data which means that it is not filtered, therefore, the baseline and noise are all shown in this figure. The raw spectral data can be filtered by checking filter box at the bottom of the display window. (b) is a filtered copper spectral data that displays only peaks. To distinguish copper from the filtered peaks, copper is enabled in periodic table. Then, all the copper ion peaks: Cu(I), Cu(II), and Cu(III), are labeled with white boxes to the corresponding peaks in display window. (c) is the enlarged area of copper spectrum where it shows the significant copper ion (Cu(II)) peaks at 510.5, 513.3, and 521.8 nm. Those three major peaks are labeled based on copper spectrum from NIST database to indicate they are generated from copper. Another way to identify the element is to overlap the measured spectrum with reference spectrum provided by the software. The result of function is displayed in (d).

The software is available for download from the following address:

<http://vault.cyto.purdue.edu/sibs/sibs.zip>.