Summary: McCrone Analysis of COT Wire

Wires are 40 micron tungsten with about 0.5 micron gold plating.

EDS Analysis: Wire samples are probed with an 5-10keV electron beam. Electrons are ejected from inner atomic shells and the energies of the x-rays generated when these shells are refilled gives a measure of the atomic makeup of the sample. A new wire showed mostly gold with some carbon (carbon thought to be from contamination of sample). An aged wire showed mostly carbon with some oxygen and some gold. This analysis is not sensitive to hydrogen.

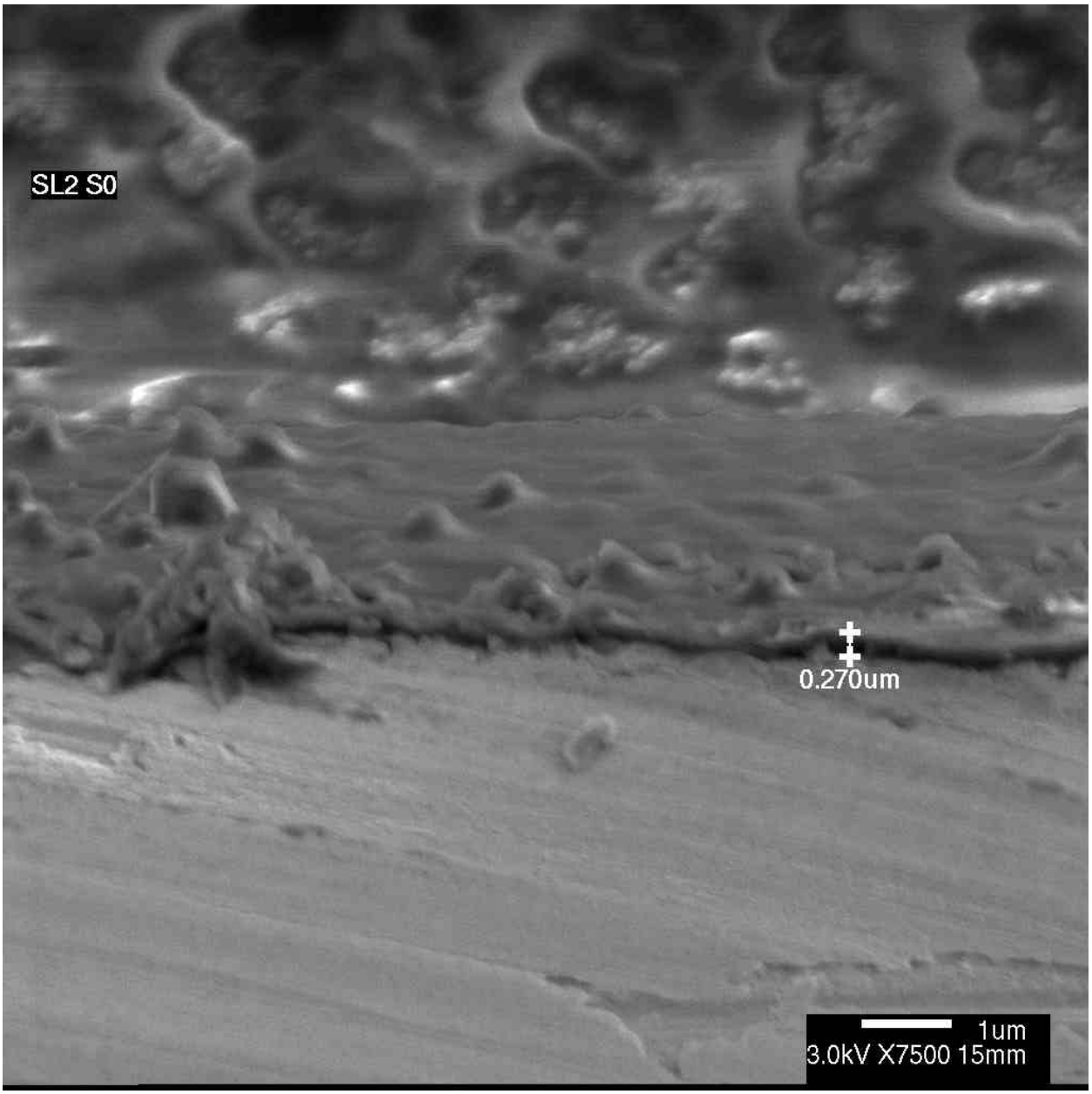
XPS Analysis: Samples are irradiated with 1400ev x-rays. An energy scan of the secondary electrons emitted gave an indication of the molecular bonds. The best measurement of an aged wire gave 88% CC and CH bonds and 10% C-O bonds. C=O bonds were <1%. This scan is not sensitive to OH bonds.

FTIR Analysis: Sample is irradiated with infrared photons. The reflected photon spectra is examined for dips associated with absorption bands to give information on the molecular structure. The spectrum from an aged wire had the following features: a broad dip associated with the O-H bond (stretching); sharp dips associated with CH2 and CH3 bonds; and much smaller dips associated with C=O bonds.

FESEM Analysis: A very precise electron beam from a point field emission source gave a very high resolution picture of surface features. The following picture shows an area of an aged wire where the coating has been removed. In the foreground is the bare wire. In the background is the coating (appears dark, about 0.3 microns thick) with some small sub-micron nodules on it.

The tests all indicate that the coating is mostly hydrocarbon chains with some oxygen in the form of O-H and C-O bonds. No contaminants were identified. The level of silicon, a common contaminant, appeared to be very low.

These results are consistent with the coating coming from the ethane and the isopropanol in the gas. In this hypothesis polymers are built up as the gas flows through the chamber in the presence of avalanches. When the polymers get long enough, they stick to the wire.


SL2 S0
0.270um
1um
3.0kV X7500 15mm