Abstract:
On-chip interconnects are electrical wiring systems that connects transistors and other components in an integrated circuit. Copper (Cu) has been our main interconnect for over two decades. Over the years, the dimensions of Cu interconnects have decreased for better computing performance, and finally Cu has reached its limitations where under 15 nm of the interconnect width, signal delays and larger energy consumptions are significant due to the high resistivity of Cu interconnects stemming from surface and grain boundary scattering of electrons.

In contrast, topological metals, especially molybdenum phosphide (MoP), have shown promise as our next interconnect metals owing to their topological surface states that are resistant to scattering. We convert molybdenum sulfide (MoS$_2$) flakes to MoP by chemical vapor deposition and use electron beam and etching to create narrow nanoribbons. Four-point probe measurements show the resistivity to be 13 microohm-cm, demonstrating the viability of MoP as future interconnects.

Summary of Research:
Within the first two weeks of the program, we had several conferences, an in-person safety training course, a general online chemical safety training and lastly a cleanroom safety training while simultaneously reading relevant publications.

First, we got trained in the atomic force microscope (AFM). Then we got trained on the scanning electron microscope (SEM) with Nabity alongside. Later we were trained on how to use the RC2 ellipsometer. Then we were trained in the reactive ion etcher (RIE), specifically the PT720 Model.
chromium (Cr) and gold (Au) using the e-beam evaporator to facilitate contact when measuring the nanowire’s resistivity. If the second e-beam process was successful, we would then develop the sample with isopropyl alcohol (IPA) for about two minutes or less to see if the exposure was successful so we can do deposition then measure the resistivity of the nanowire.

**Conclusions and Future Steps:**

We successfully fabricated our narrow MoP nanoribbons to determine the resistivity of MoP under 20 nm. The resistivity of the etched nanoribbon was high, possibly due to damage during the fabrication process.

Potential improvements to this process include exploring other etching processes and limiting ambient exposure during the whole fabrication process. Also use X-ray diffraction (XRD) throughout the fabrication process to determine whether our sample changed states or if it remains MoP throughout the fabrication process.

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**References:**


