A New Evaporator for the Houghton College Deposition Chamber

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Chamber for Physical Vapor Deposition of Thin Metal Films

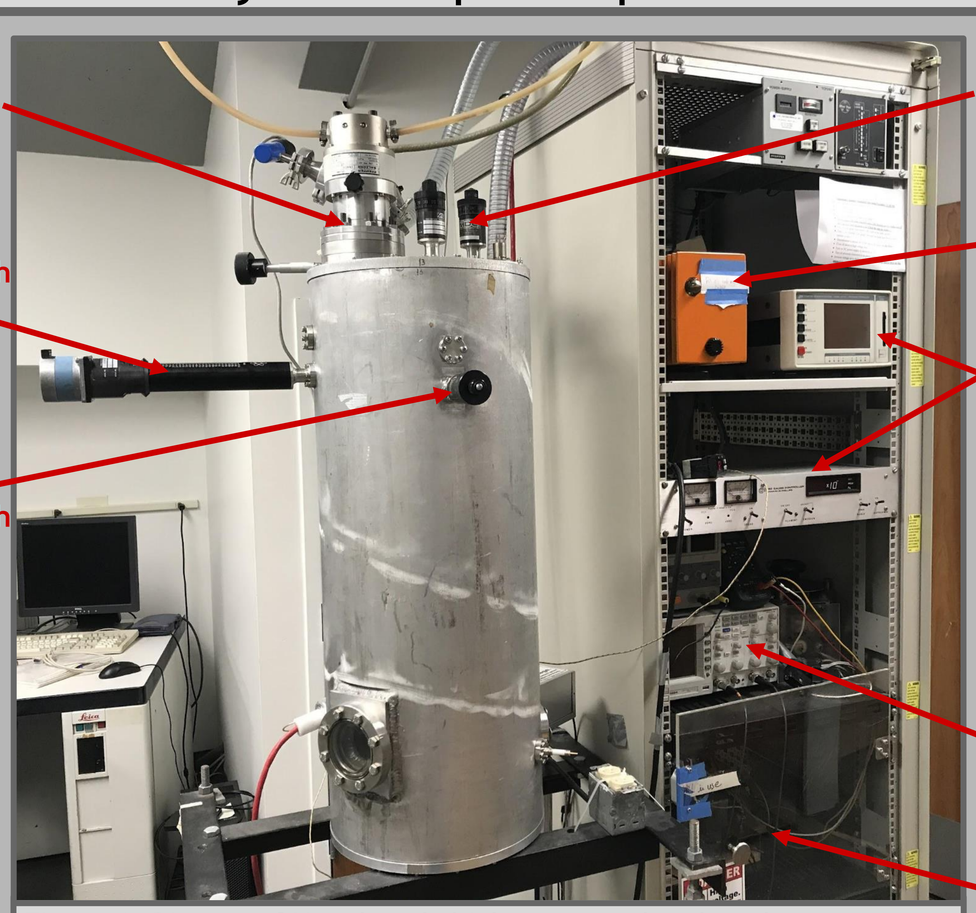

Figure 1: Picture of Houghton's high vacuum chamber (base pressure 10^{-6} Torr) used to deposit thin metal films on a Si substrate

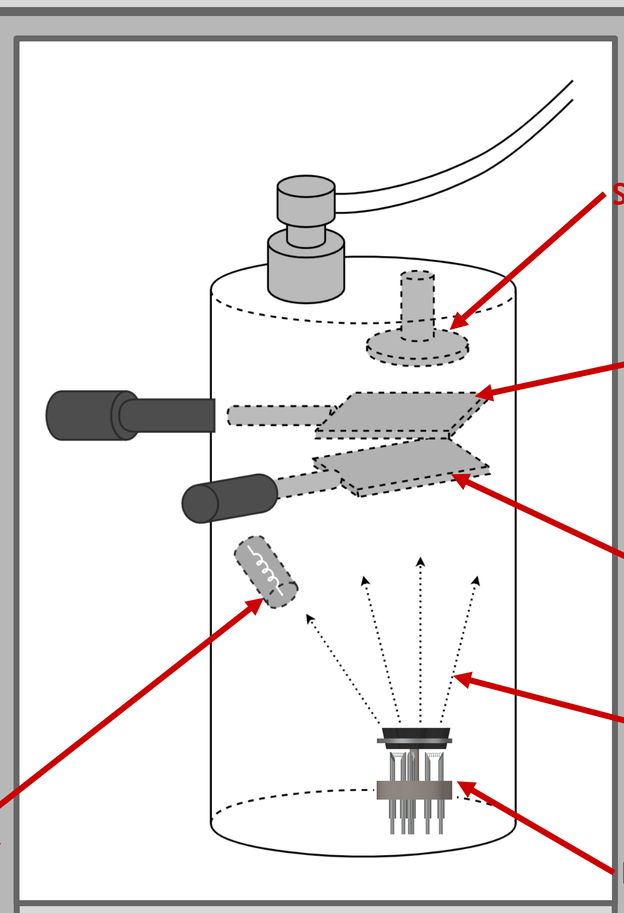

Figure 2: Diagram of the chamber internals. The motorized linear feedthrough allows gradient thickness of film, and the rotary shutter can be used to block the substrate.

New Evaporator Design

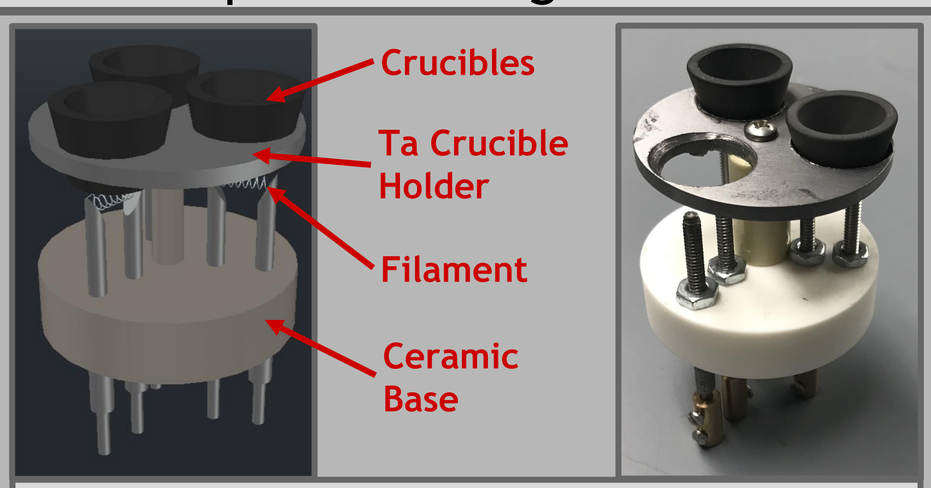

Figure 3: Image of the new evaporator designed in AutoCAD before construction (left). Picture of new evaporator with three crucibles, each heated by thermionic emission from W filaments (right). These can be independently controlled for deposition of multilayer alloy films.

Deposition Rate Monitor

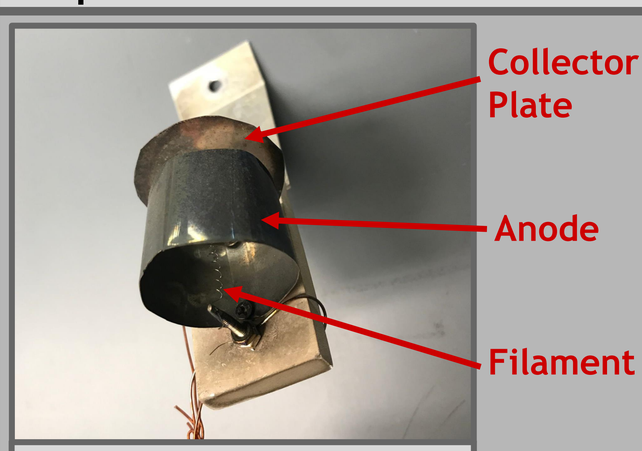

Figure 5: Picture of deposition rate monitor. Vapor is ionized by the filament and accelerated towards the collection plate. The collection rate is proportional to the evaporation rate.

Silicon Substrate

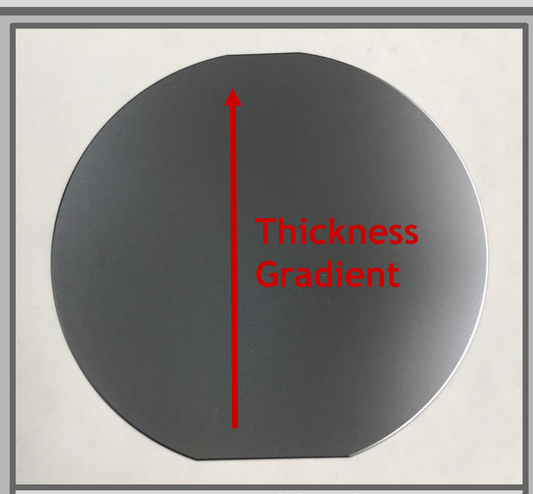

Figure 6: Picture of Si substrate on which the metal film is deposited. Using the linear shutter, a film with a thickness gradient can be produced.

High Voltage Circuit

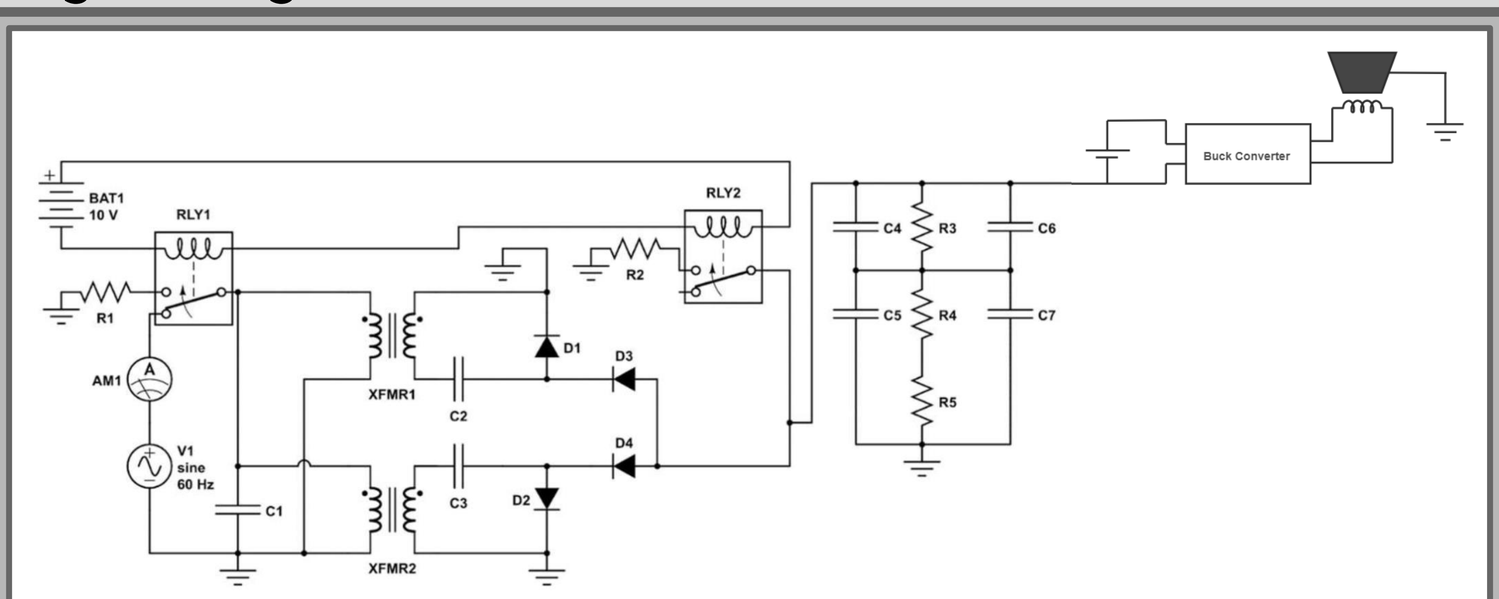

Figure 7: High voltage circuit floats filaments at approximately -4 kV via two microwave transformers and voltage doublers that are out of phase with each other. Capacitors C4-C7 smooth the final high voltage. A buck converter floating at this high voltage supplies current to the filament.

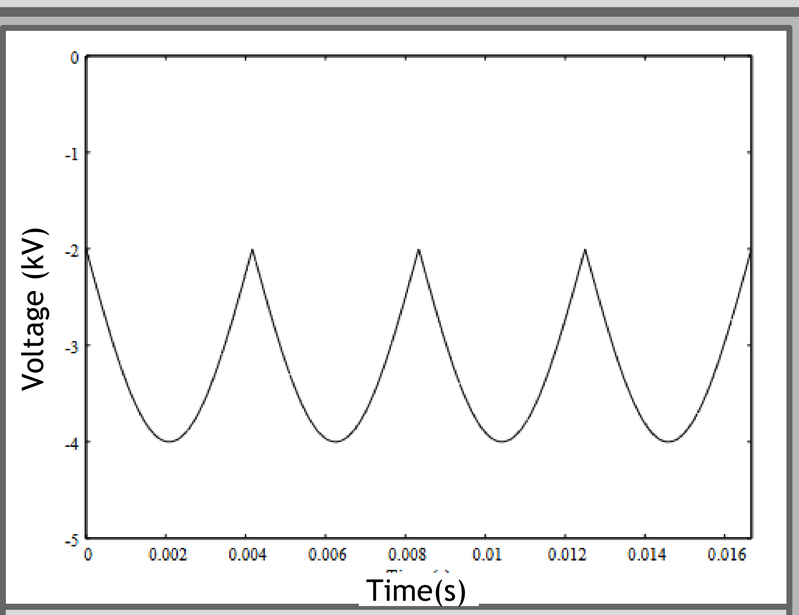

Figure 8: Graph of simulated ideal voltage output before capacitors C4-C7, reaching minimum of -4 kV.