An Evaporation Deposition System for the In-Situ Study of Thin Metal Films

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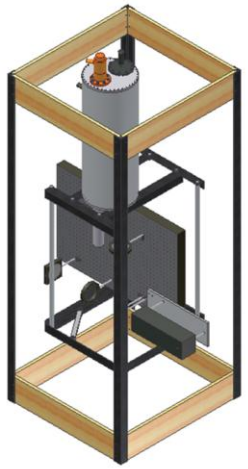
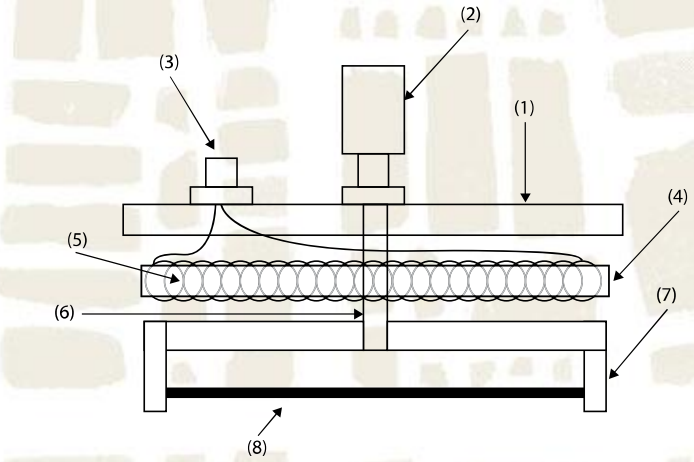
Outline

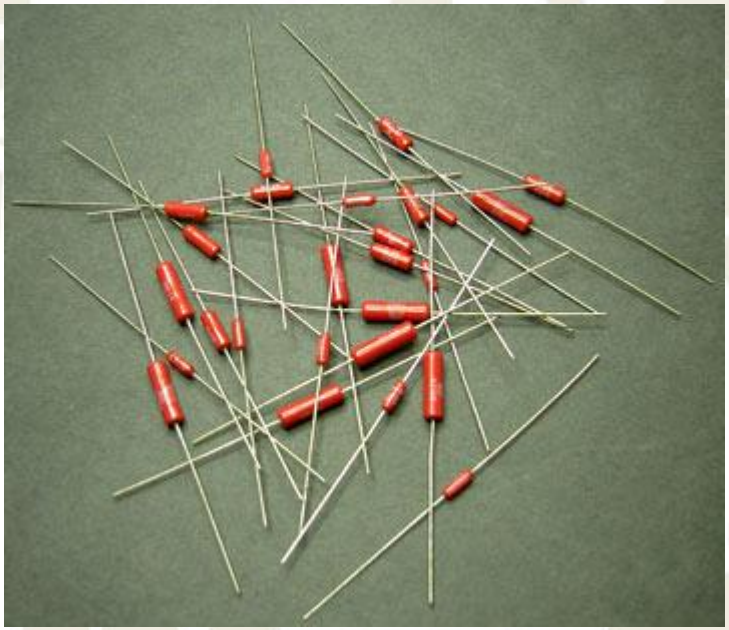
- Motivation
- Thin Films Explained
- Construction of PVD chamber
- Current state and future plans





Applications of Thin Films

- Microelectronics and/or Nanoelectronics
- Photovoltaic Cells
- Batteries
- Mirrors
- Decoration
- Optics



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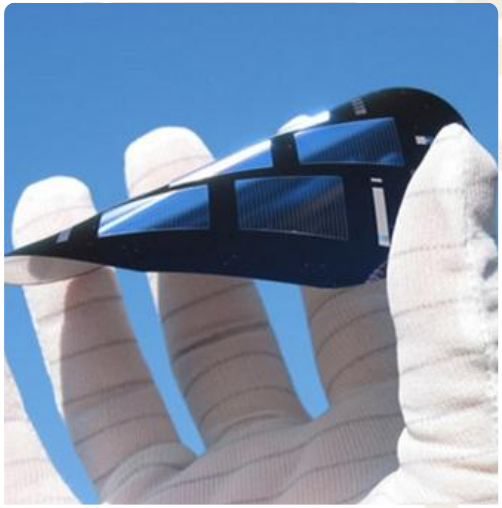

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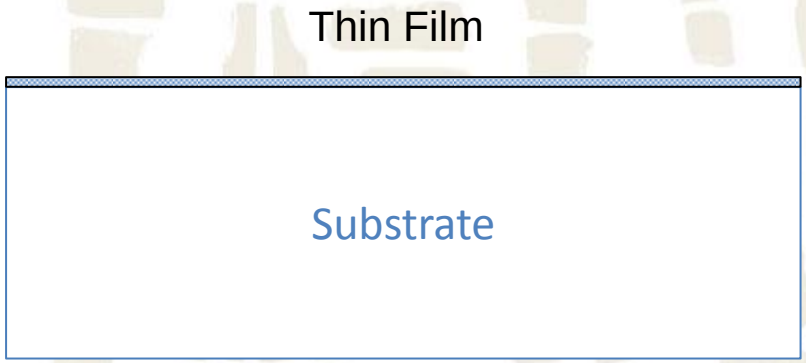
Introduction to Thin Films

- Usually 2µm or less in thickness
- Created by Evaporation
- Many of the characteristics are unknown



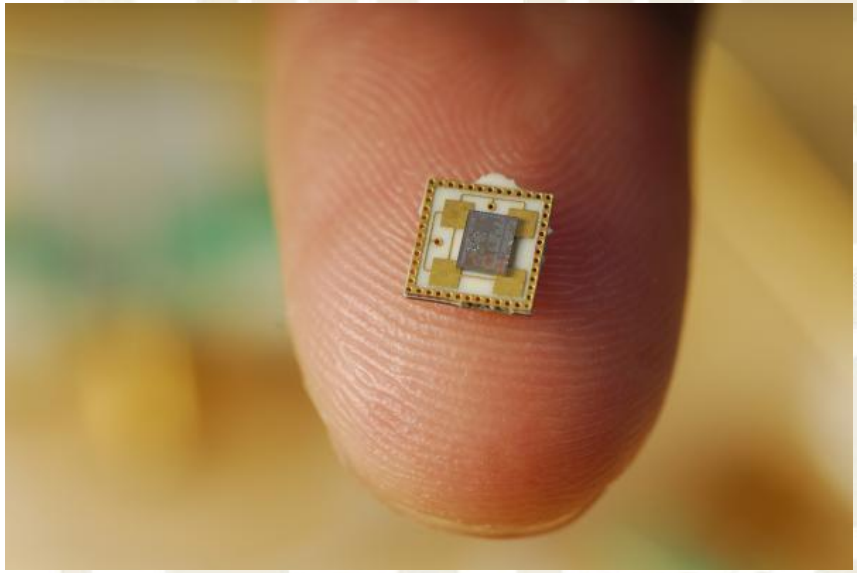
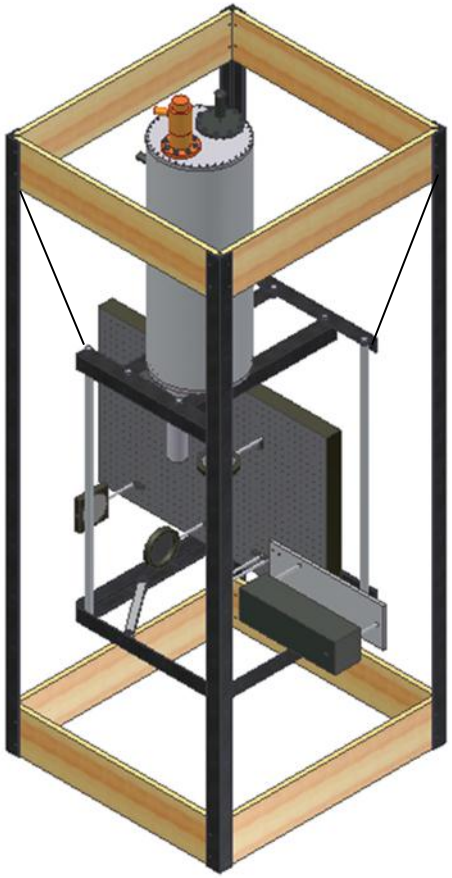


Image taken from sciencedaily.com



Research Goal

- Produce thin films for the study of atomic structures, heating, and transformation

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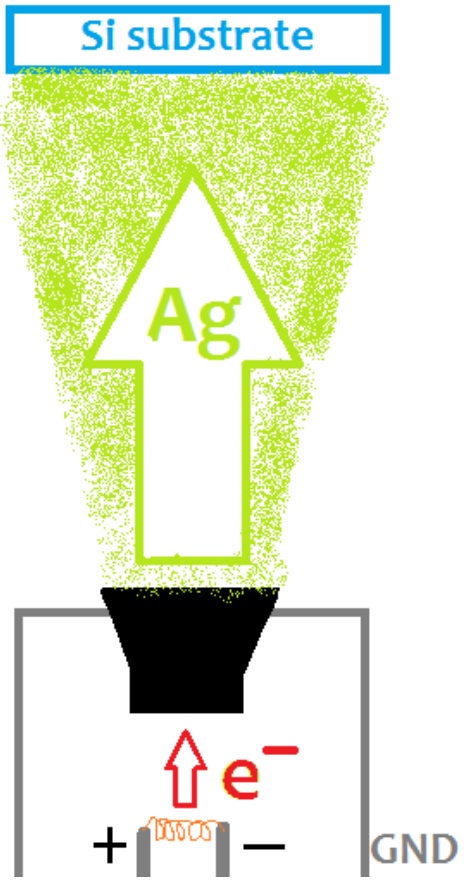
Producing Films

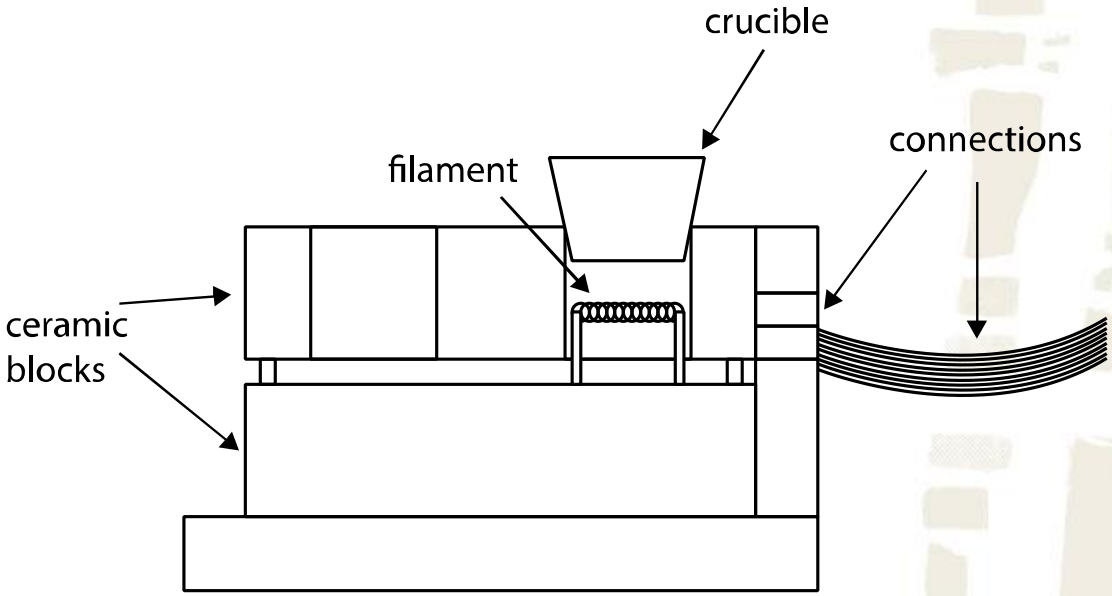
- Vacuum Chamber
- Deposition

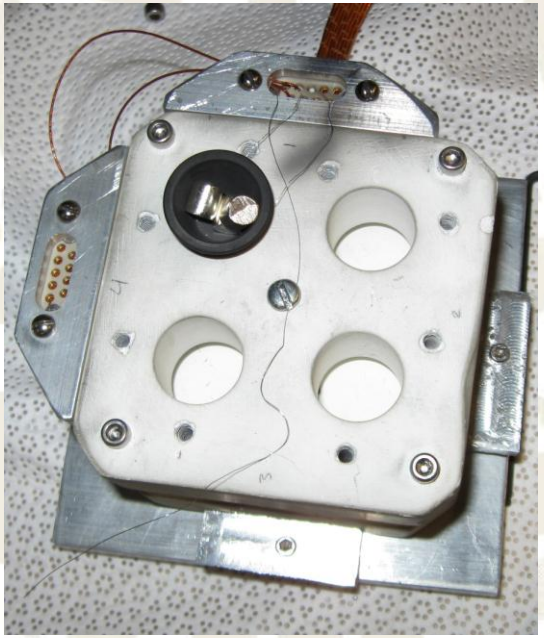
Film Deposition Processes



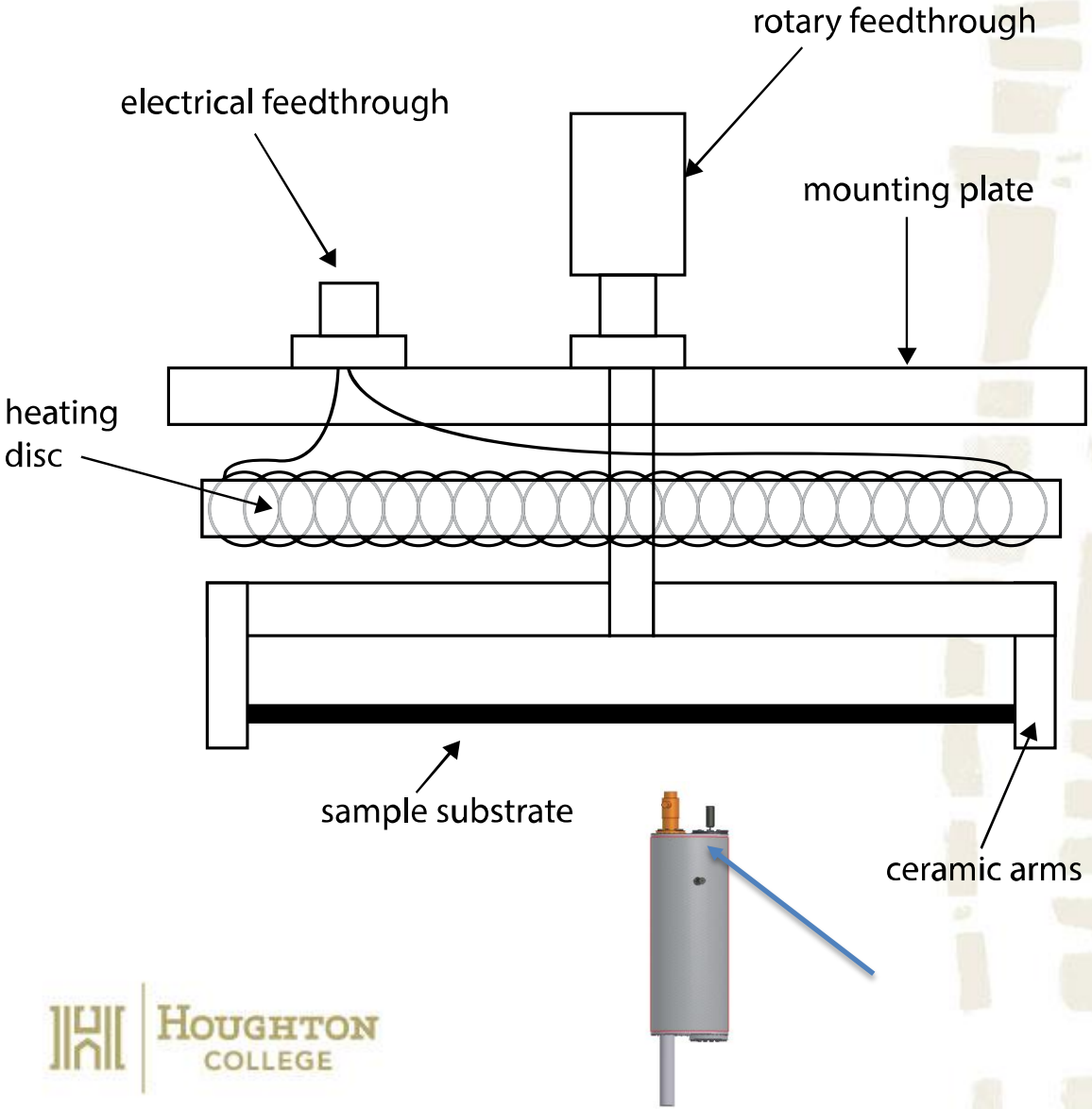
- Physical Vapor Deposition Process
- Done in High Vacuum
- Thermionic Emission

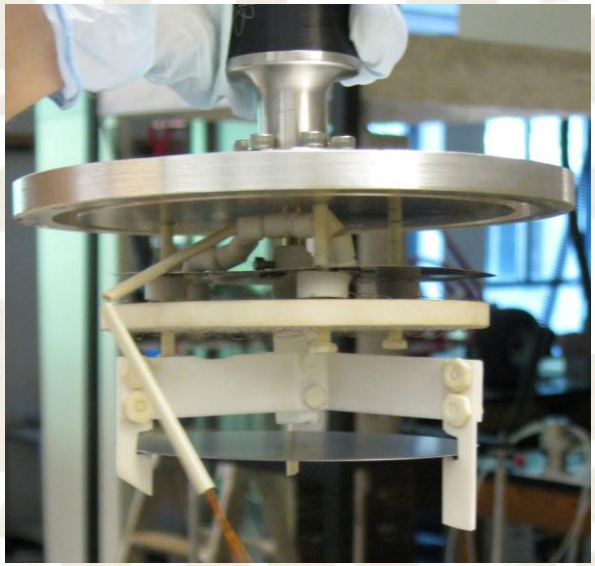
Film Deposition Process (the block)





Film Deposition Process (the SSH)





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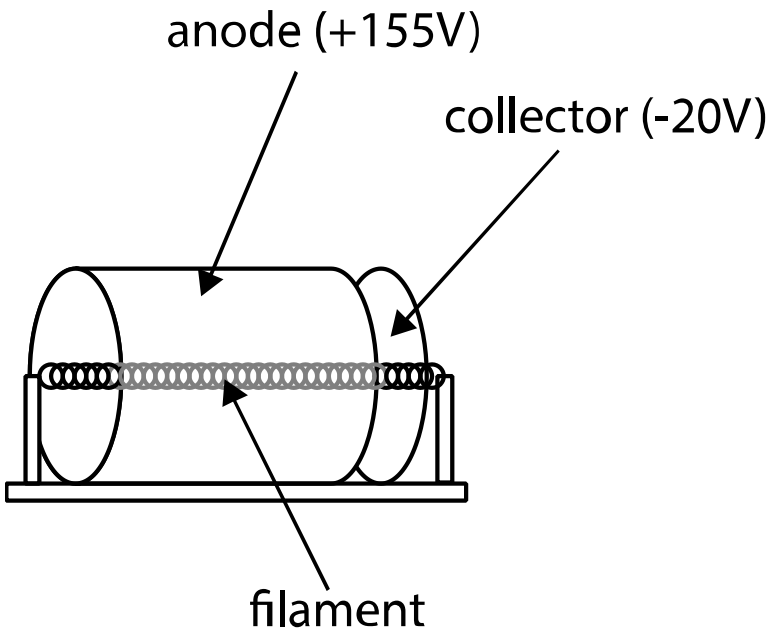
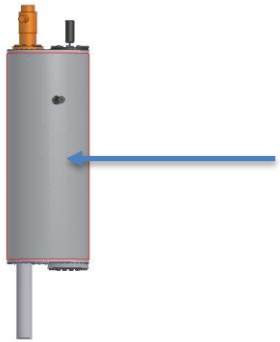
Giedd and Perkins Evaporation Rate Monitor (ERM)

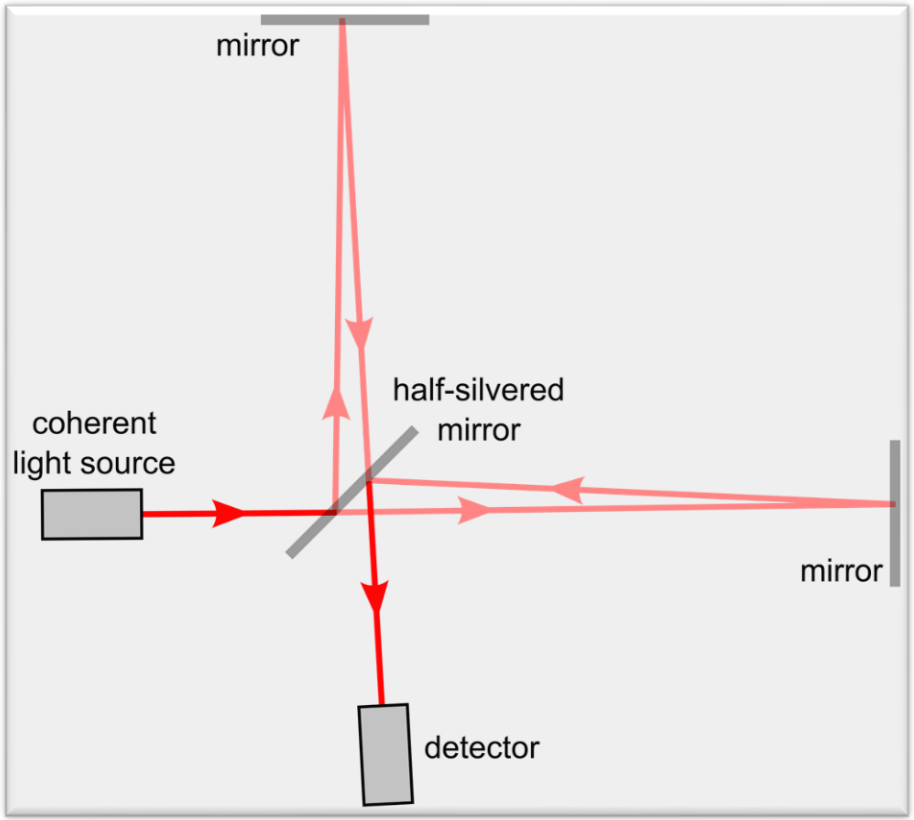




Constructed PVD Chamber

- Outer/Inner Frame
- Electronics Tower
- Baking capability
- Ion Pump (not pictured)

Measurement of Films



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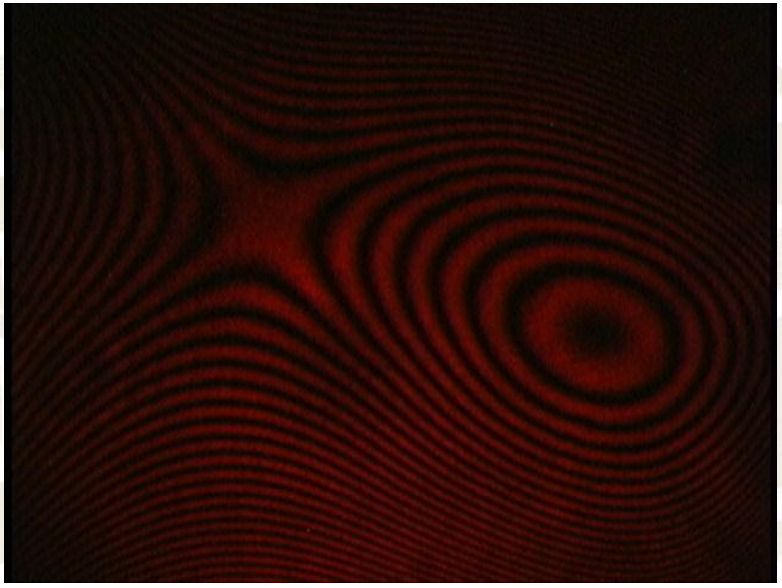
- Observation of Films
- Michelson-Morley Interferometer



Current State of Project

- Chamber Built
- Achieved High Vacuum (below 10^{-7} torr)
- Filament Testing

The Next Steps

- Determine filament voltages
- Integrate ERM
- Use ion mill to further clean wafers
- Produce thin films for study

Houghton Summer Research Institute

Houghton College

Brandon Hoffman, Tyler Reynolds, Nicholas Fuller, Kyle Flemington,
Houghton College

Kurt Aikens, Lindsay Timian, Adam Silvernail, Past Team Members

ACKNOWLEDGEMENTS

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