

ePIC pfRICH Aerogel Refractive Index QA

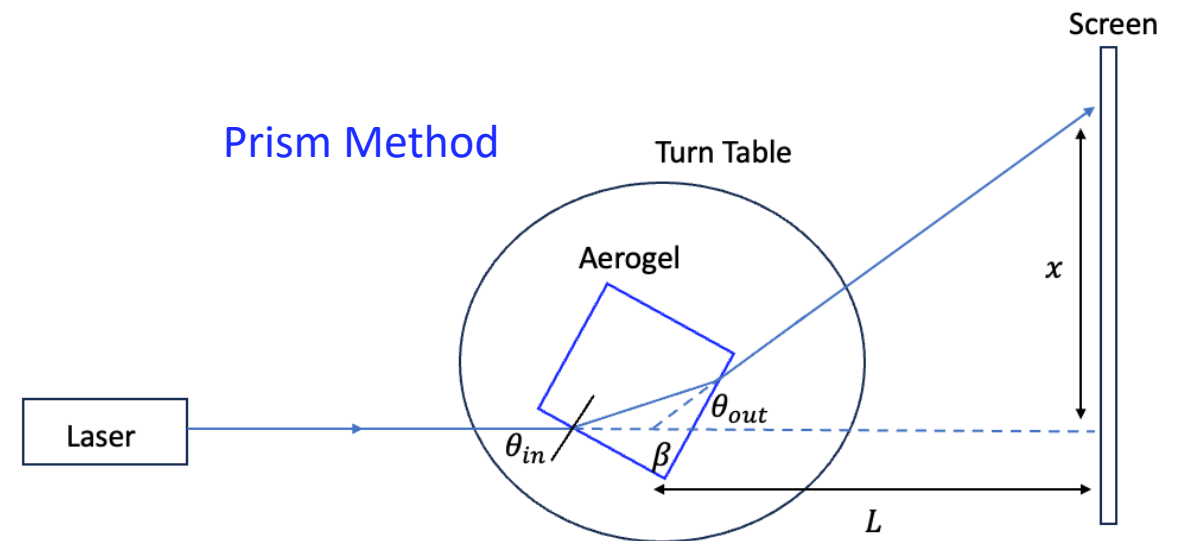
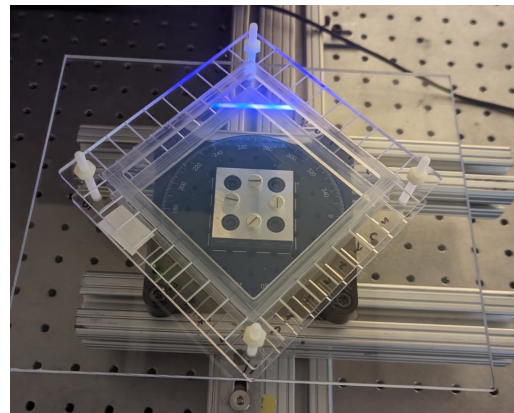
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❑ Current refractive index measurement

- Light passes through corner of aerogel and minimum deflection angle is used to obtain refractive index
- Limitation: measurements restricted to corners

❑ Production tiles will be cut to shape via water jet

- Optical quality of edges will be lost
- Need new procedure to measure refractive index



1. Density

- Fit refractive index vs. density measurements from known tiles
- Apply fit results and measured density to predict refractive index of unknown tile

2. Brewster's Angle

- Exploits changes in light polarization
- Allows for measurements across tile area

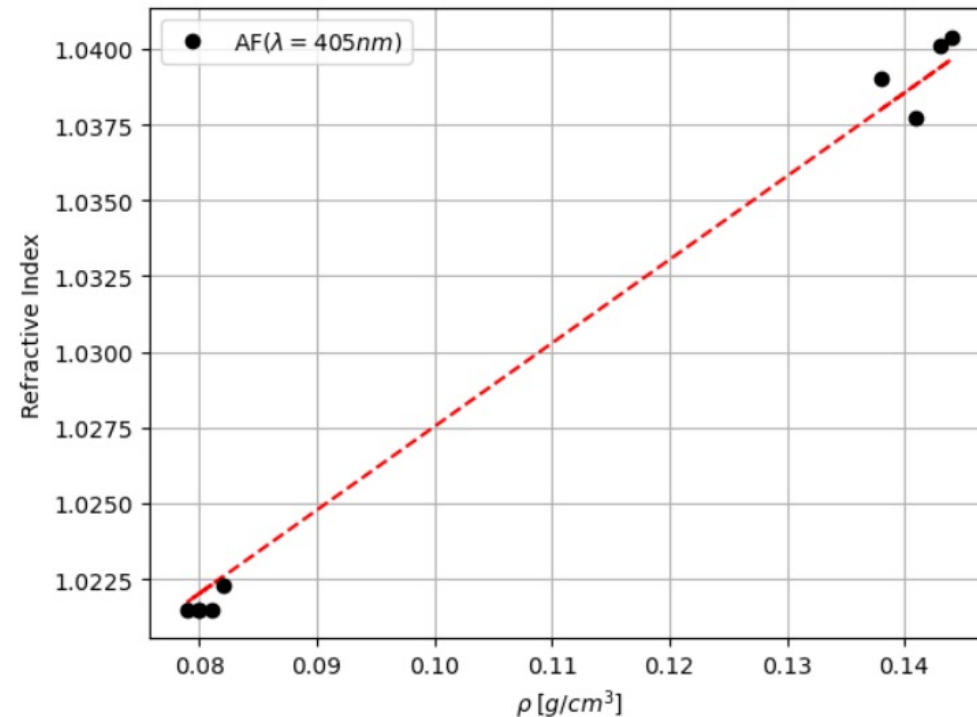
3. Ellipsometry

- Used in material science/ condensed matter fields on thin films
- Measures change between incident and reflected light polarization
- Appears applicable to only thin samples (~ nm)

- ❑ Use tiles with optical quality to extract refractive index vs density dependence
 - Based on measurements of light through tile corners
- ❑ Refractive index can be estimated from unknown tile via its density measurement and the above fit result
- ❑ Could serve as quick and easy check of refractive index

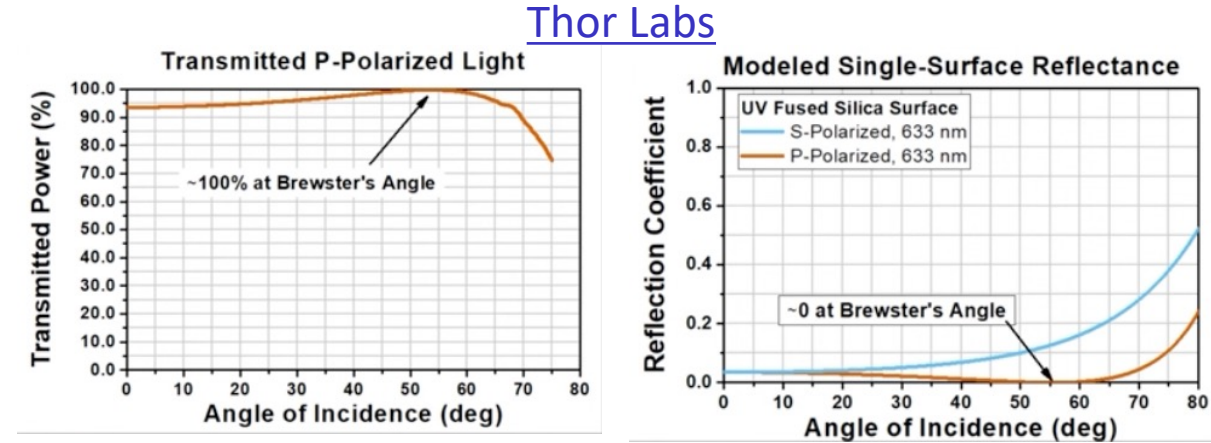
- ❑ Fit function

- $n = 1 + k(\lambda) \cdot \rho$
- Fitting Aerogel Factory specs on tiles:
 - $k(\lambda = 405nm) = 0.275 \text{ cm}^3/g$

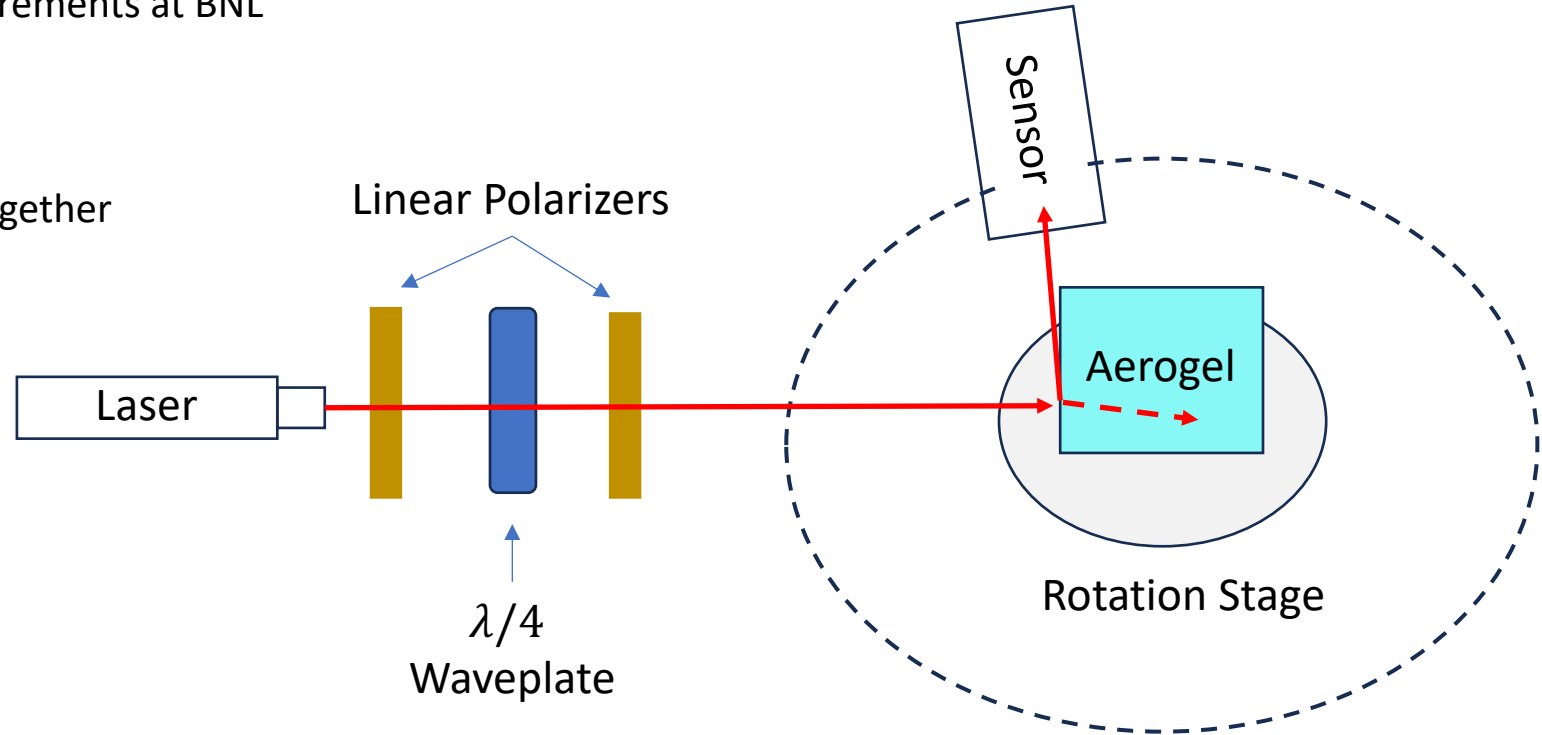


Brewster's Angle

- ❑ Determine refractive index from Brewster's angle:
 - $n_{aero} = n_{air} \tan(\theta_B)$
 - θ_B from minimum reflected P-wave polarization
- ❑ Reference beam via beam splitter could be added
- ❑ Can mimic setup used in reflectivity measurements at BNL
 - e.g. rotation stage / arms
- ❑ Funding would be needed to put system together



n_{aero}	θ_B [deg.]
1.040	46.12
1.041	46.15



Any other methods or
comments/suggestions for presented
methods?