**THz Resonances in Chiral Aluminum Nanowires**

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**Our Message**

- Glancing angle deposition used to grow sculptured thin films composed of achiral and chiral aluminum wires
- Ellipsometric measurements of chiral nanowires in the far- and midinfrared spectral domain reveal equally spaced resonances with $\Delta \nu \sim 7.5\,\text{THz}$
- A first approach interprets THz resonances using a simple LC model
- Mueller matrix mapping in the NIR spectral range allows immediate determination of symmetry of the nanostructures

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**Properties of Sculptured Thin Films**

**Chiral THz Resonances in Chiral Aluminum Nanowires**

- Muller matrix mapping in the NIR spectral domain reveals equally spaced resonances of self-organized nanostructures with a wide variety of shapes and different semiconductors or metals

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**Glancing Angle Deposition of Aluminum Nanowires**

**Achiral STF**

- Structure shadow
- Particle flux
- Surface diffusion

The incoming particle flux at glancing angle causes self-organized columnar growth due to shadowing and slow surface adatom movement.

**Chiral STF**

- Vertical aluminum screws are grown while performing continuous substrate rotation during GLAD.

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**Optical Response of Aluminum Nanowires**

**NIR Mueller Matrix Mapping**

- Non-zero reciprocal difference $(M_{ij}(\psi) - M_{ij}(\psi + \delta))$ hints to the existence of bi-anisotropic material properties and 3-fold symmetry of the STF.

**Infrared Ellipsometry**

- Equidistant resonances! **Achiral STF** shows simple Drude-like behavior. Best fit values for resistivity and scattering time are $\rho = 10.9 \times 10^{-12}\,\text{cm}$ and $\tau = 1.0\,\text{fs}$, respectively.

**Comparison with aluminum bulk values**

- Bulk: $\rho = 0.29 \times 10^{-8}\,\text{cm}$, $\tau = 6.7\,\text{fs}$
- STF: $\rho = 10.9 \times 10^{-12}\,\text{cm}$, $\tau = 1.0\,\text{fs}$

**Constitutive relations for bi-anisotropic materials:**

$$D = \varepsilon E = \sqrt{|\varepsilon_{11}|} (\hat{z} - \hat{\rho}) H$$

$$B = \mu H = \sqrt{|\mu_{11}|} (\hat{z} + \hat{\rho}) E$$

**THz resonances modeled using Lorenzian lineshapes in the chiral tensor components + Drude-like isotropic dielectric background**

**STF: $\rho = 120 \times 10^{-12}\,\text{cm}$, $\tau = 0.6\,\text{fs}$**

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