



Thermodynamics and nonlinear mechanics of materials with photoresponsive microstructure

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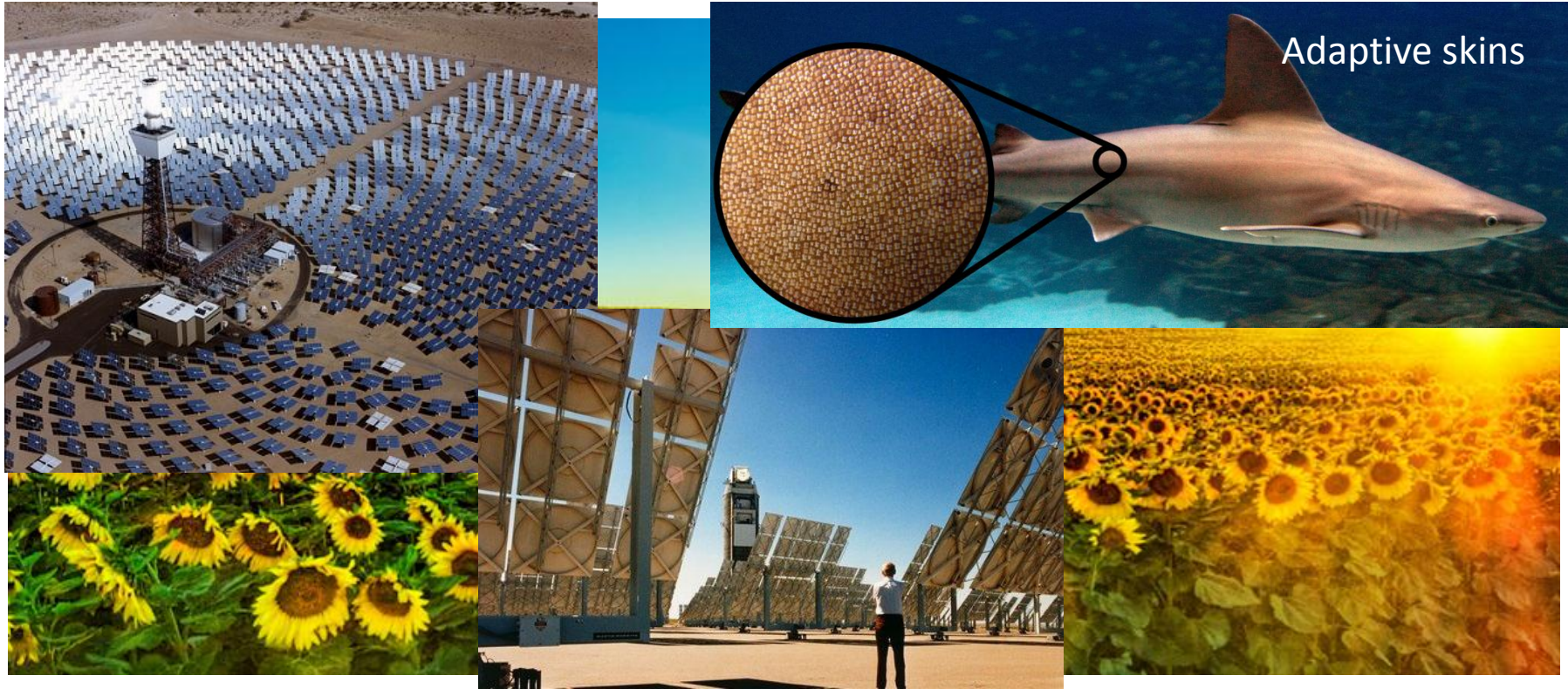
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Motivation



Gasoline energy density: 34 GJ/m^3

Solar energy density: $\sim 1 \text{ GJ/m}^3$

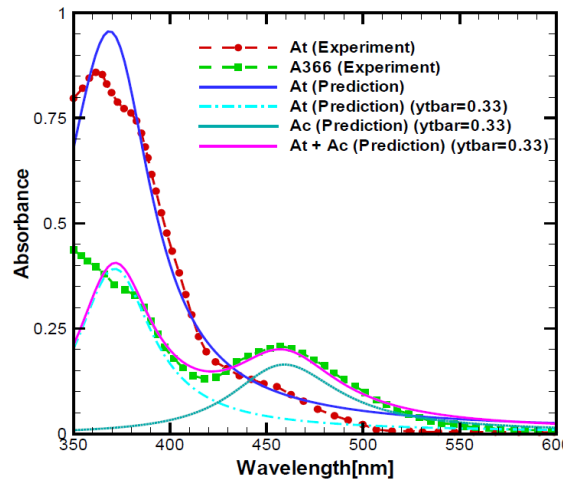
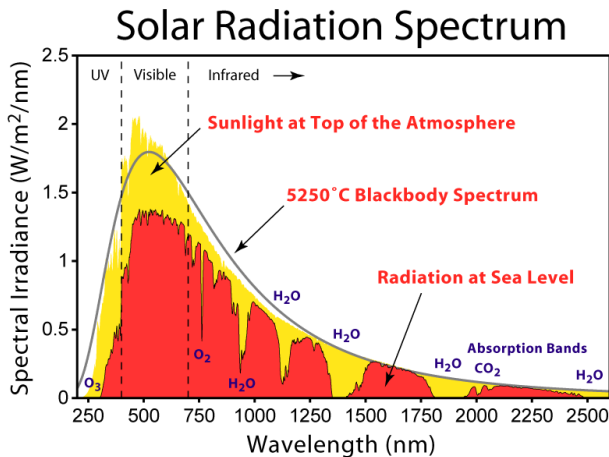
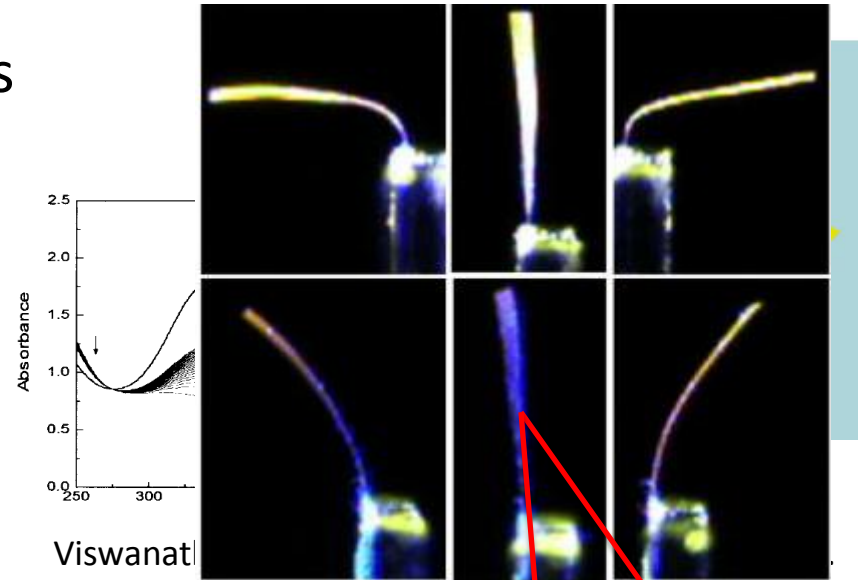
Assumptions: 1 sec dwell time of 1 W/cm^2 into $10 \mu\text{m}$ thick material

Nominal solar radiation: $0.1 \text{ mW/cm}^2/\text{nm}$

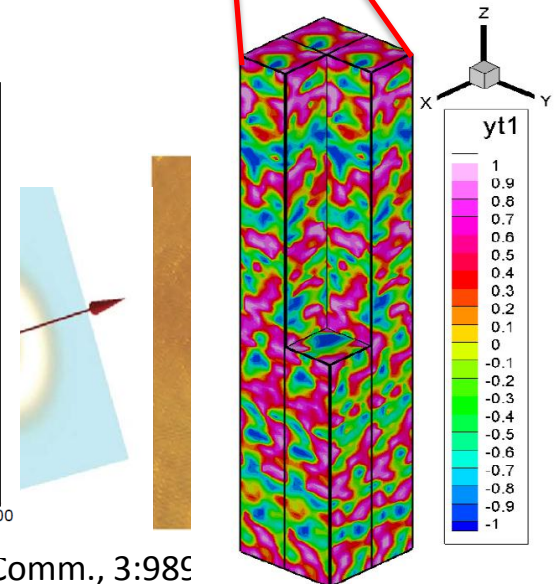
H. Koerner et al., *Materials Today*, **11**(7-8), pp. 34-42, 2008.

Material Concept

- Light activated adaptable structures
 - Temporal and spatial shape control
 - Remote actuation (line of sight)
- Microstructure
 - Liquid crystal polymer network
 - Design of morphing via microstructure
- Constitutive behavior
 - Polymer—liquid crystal coupling
 - Photoisomerization

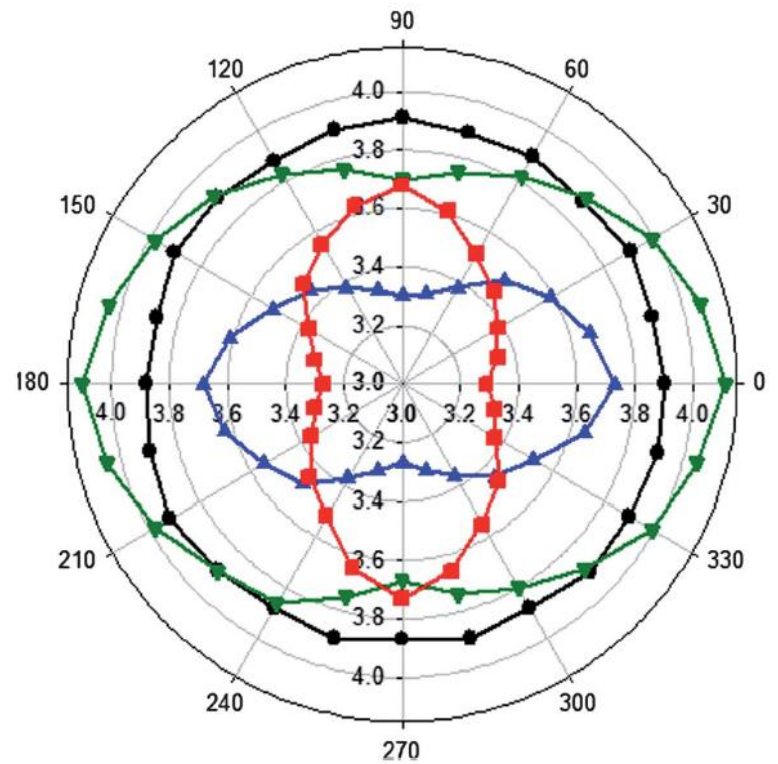
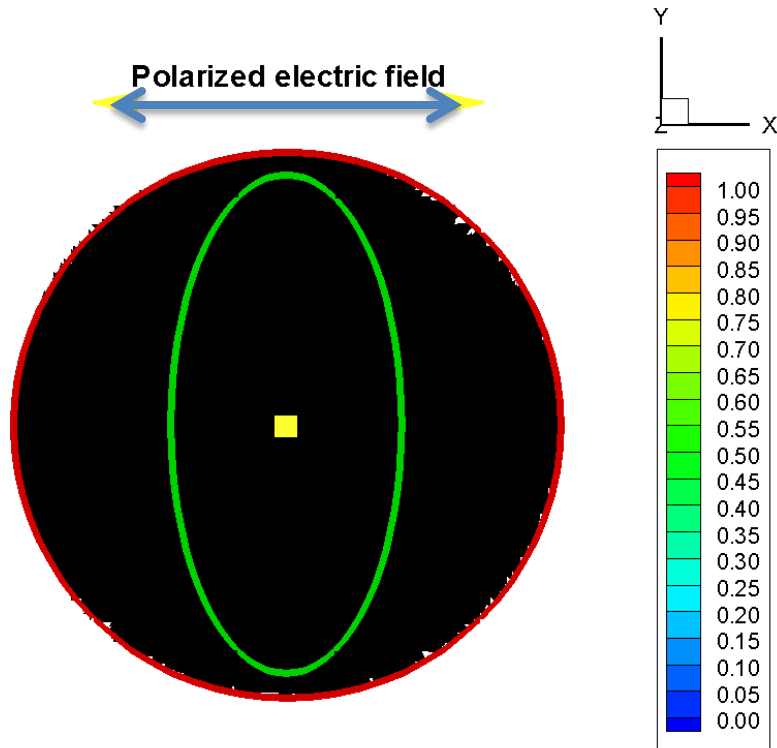


A. Ambrosio, et al., Nat. Comm., 3:985



Dichroic Absorption

Trans state



K.-M. Lee, et al., J. Mat. Chem., 22: 691, 2012.