Smart Windows for Energy Saving in Built Environment

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Where innovation starts
Motivation

Energy Neutral Buildings

- Heating, Cooling, and Ventilation: 50%
- Lighting: 25%
- Water Heating: 15%
- Other: 10%

U.S. Buildings Energy End-Use
Infrared Region Responsible for Heating

Data taken from National Renewable Energy Laboratory
Smart Window

- **Summer**
  - Solar Radiation (90%)
  - Visible Light
  - Infrared Radiation (10%)

- **Moderate**
  - Solar Radiation (50%)
  - Visible Light
  - Infrared Radiation (50%)

- **Winter**
  - Solar Radiation (10%)
  - Visible Light
  - Infrared Radiation (90%)
Liquid Crystals
Electrically Tunable Infrared Reflector

Switching Time

Transmission at 1150 nm

Time (sec)

Transmission at 1150 nm

Time (sec)
Reversibility

Transmission at 1150 nm

Time (sec)

0 V/μm
1.0 V/μm
12% of the energy used on heating and cooling can be saved in the building environment using this smart window.
We believe a dramatic improvement in sustainability can be made in the built environment using this technology!
Thank you
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Angle Dependent Studies of static IR Reflector
Simulation Shows Impact of Switchable IR Reflector on Energy Savings

We have NOT considered the switching energy in these simulations!!

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Possible Mechanism


~ 50 μm cell
75 pitches