A Phase-Changing Polymer Film for Broadband Smart Windows Applications

Tech ID: 31985 / UC Case 2020-101-0

SUMMARY

UCLA researchers in the Department of Materials Science and Engineering have developed an energy efficient smart window coating with wide light bandwidth and long cycle lifetimes.

BACKGROUND

Buildings account for ~ 40% of all U. S. primary energy use and associated greenhouse gas (GHG) emissions (U.S. Department of Energy). There is a growing demand to reduce energy consumption through energy efficient buildings. Smart windows can improve energy efficiency by controlling the timing and amount of light entering a building, reducing the overall demand for air conditioning and heating. These windows, however, can only be operated under a narrow range of light frequencies and have limited bandwidth modulation, short lifetimes, and complex production methods. Improvements are needed to improve the usability and overall effectiveness of smart windows.

INNOVATION

Professor Pei and his research team have developed a new wide bandwidth thermochromic smart window coating. This coating provides a fast and simple way to construct smart windows. The coating is opaque at ambient temperature and becomes transparent at elevated temperatures. The transition temperature of the coating can be controlled based on application needs to be in the range of 25°C-130°C. The all-solid coating has a long cycle lifetime and does not use any metal/metal oxides or liquid crystals so it can be used to modulate light over the entire solar spectrum. This smart window can be used to conserve the hot/cold air within buildings during winter/summer or provide privacy.

APPLICATIONS

- Smart windows (commercial buildings, household, automotive)

ADVANTAGES

- Wide light bandwidth
- Solution processed
- Long cycle lifetime
- No metal/metal oxides or liquid crystals

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,529,917	01/20/2026	2020-101

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Electrocaloric Cooling With Electrostatic Actuation
- An Actuator Device Driven By Electrostatic Forces

CONTACT

UCLA Technology Development Group
ncd@tdg.ucla.edu
tel: 310.794.0558.



INVENTORS

- Pei, Qibing

OTHER INFORMATION

KEYWORDS

Energy-efficient buildings, smart windows, wide bandwidth thermochromic smart window, phase-changing polymers, crystalline-to-amorphous transition, microphase separation, photochromic-based smart windows, privacy windows

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics
- **Engineering**
  - Engineering
- **Materials & Chemicals**
  - Polymers
  - Thin Films
- **Transportation**
  - Automotive

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2020-101-0

UCLA Technology Development Group

10889 Wilshire Blvd., Suite 920,Los Angeles,CA 90095

https://tdg.ucla.edu

Tel: 310.794.0558 | Fax: 310.794.0638 | ncd@tdg.ucla.edu

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