Thermally Insulating Transparent Barrier (THINNER) coatings with high transmission, thermal and radiative resistance

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BACKGROUND

Buildings in cold climates tend to use thermally insulated glass to reduce energy use. Current industrial solutions use double or triple pane windows separated by air or inert gas for thermal insulation. Double or triple pane windows, however, require high quality sealing for gas retention, window frame retrofitting, and at least two panes of window glass. This means that they are expensive and complicated to manufacture. Moreover, many older buildings are designed for single pane windows and not structurally fit to hold the weight of two panes. Alehough aerogel and and aggregate nanoparticle materials provide for a practical, alternative thermal insulation solution, they are manufactured with expensive supercritical drying techniques and lack the optical properties for window glass. This poses a need for a new material or system of materials that can achieve the thermal properties of double pane windows at a fraction of the cost while also being optically clear.

INNOVATION

UCLA researchers have developed Thermally Insulating Transparent Barrier (THINNER) coatings for single pane windows. The three-layer composite contains a substrate-free (free-standing monolith), porous ambigel with high transmittance in the visible spectrum, a low-emissive coating and optically compatible adhesive. The ambigel coating is also made and dries at ambient temperature and pressure, eliminating the high cost associated with ambigels. The coating is also hydrophobici in nature, reducing moisture retention.

The system of a combined ambigel with a low-emissivity coating on one side and a transparent adhesive on the other allows facile on-line application of the system to a sheet of glass. Additionally, this system can be applied to a preinstalled window in a building with single or double pane windows to improve thermal insulation without purchasing an entirely new window. In this way, the system can help reduce waste and costs by simple incorporation with both modern manufacturing facilities and current products.

APPLICATIONS

- Thermal insulation
- Solar-thermal energy conversion
- High function windows solution

ADVANTAGES

- Improves thermal and radiative resistance
- Low thermal conductivity
- High transmittance
- Low haze
- Can be applied to preexisting single or double pane windows
- Can be applied before or after installation
- Reduced moisture retention
- Low manufacture cost

STATE OF DEVELOPMENT

Patent Pending

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OTHER INFORMATION

KEYWORDS

Thermally Insulating Transparent Barrier (THINNER) coatings, thermally insulated windows, porous oxide ambigels, aerogels, low-emissivity coatings, thermal resistance, surface-modified ambigels, silica, optically transparent coatings, ambigel, aerogel, th

CATEGORIZED AS

- **Energy**
  - Other
  - Solar
- **Engineering**
  - Engineering
- **Materials & Chemicals**
  - Ceramics
  - Composites
  - Nanomaterials
  - Polymers
  - Storage
  - Thin Films

- **Nanotechnology**
  - Materials
- **Transportation**
  - Automotive

RELATED CASES

2018-187-0, 2018-863-0, 2018-869-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Cleaning Lithium to Improve Protective Layer
- Charge Storage Device Architecture For Increased Energy And Power Density
- Protective Film for Lithium Electrodes
- Thermomechanical Cycle for Thermal and/or Mechanical Energy Conversion Using Ferroelectric Materials

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