A Multi-Stage Cascade Air Conditioning and Refrigeration System Using Thermally Responsive Liquids

Traditional AC and refrigeration techniques can have a negative impact on the environment

This invention improves temperature and humidity control efficiency by utilizing multiple stages of thermally responsive liquids. These liquids are heated into two immiscible phases, each with unique properties. One stage expels water to adjust outdoor humidity, while another absorbs moisture to manage indoor humidity. This sequence aims to achieve lower temperatures and humidities, improving comfort and cooling efficiency. The invention addresses the limitations of traditional AC and refrigeration technologies, which have a high global warming potential. It also aims to overcome the energy inefficiency of current cooling and dehumidifying devices, often limited to a single climate zone due to humidity operating range constraints.

New methods lessen negative environmental impacts

An innovative technology that employs thermally responsive liquids in multiple stages to enhance conventional air conditioning and refrigeration systems, delivering eco-friendly cooling and dehumidification with zero global warming potential.

Summary Bullets

- Innovative technology using thermally responsive liquids in multiple stages enhances air conditioning and refrigeration systems.
- Currently at proof-of-concept stage, it aims to improve temperature and humidity control efficiency.
- Offers eco-friendly cooling and dehumidification with zero global warming potential, targeting residential, commercial, and data center applications.

Solution Advantages

• This system uses refrigerants with zero global warming potential, unlike traditional AC and refrigeration technologies.

- It is powered by renewable heat sources, such as solar or waste heat, which reduce energy costs.
- The system can achieve lower indoor temperatures and humidities, thereby improving comfort levels.
- Multiple stages allow the system to operate in a wider range of relative humidities.

Potential Commercial Applications

- Residential and commercial air conditioning systems.
- Household refrigeration and food preservation.
- Data center humidity and temperature control.

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IP Status

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Publications

Required Properties of Lower Critical Solution Temperature (LCST) Mixtures for Use in a Dehumidification and Cooling Cycle., AlChE - 2023

Images

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