Climate Event

Zeotropic Mixture Refrigerants for Next-Generation Sustainable Heat Pump Systems

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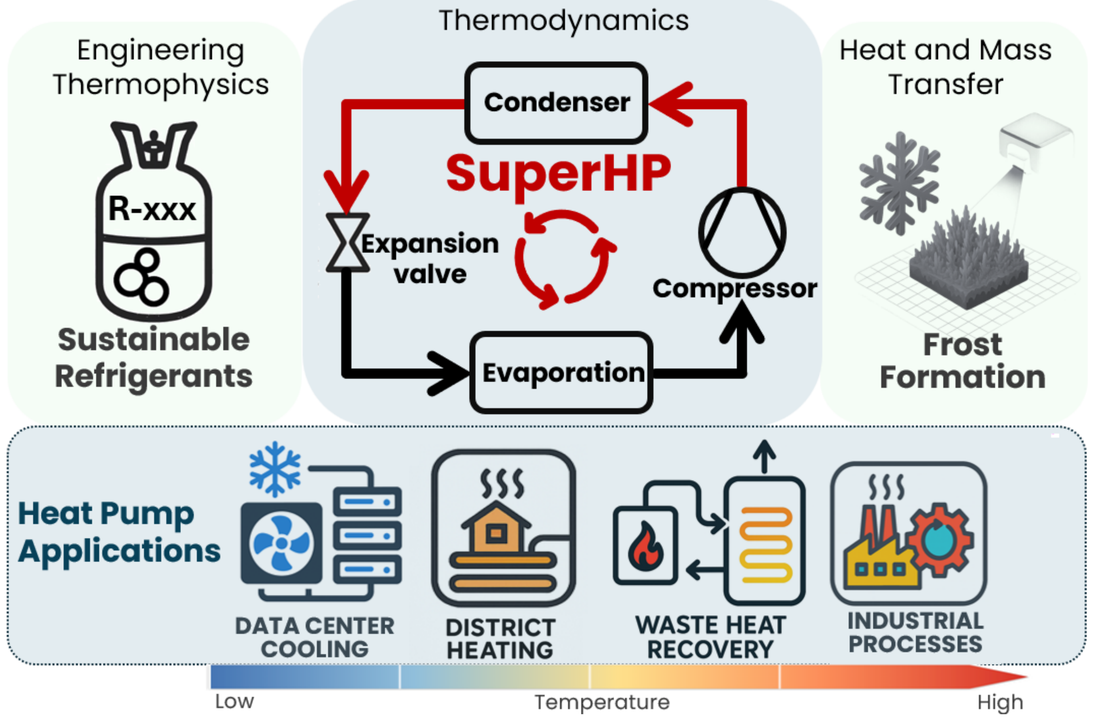
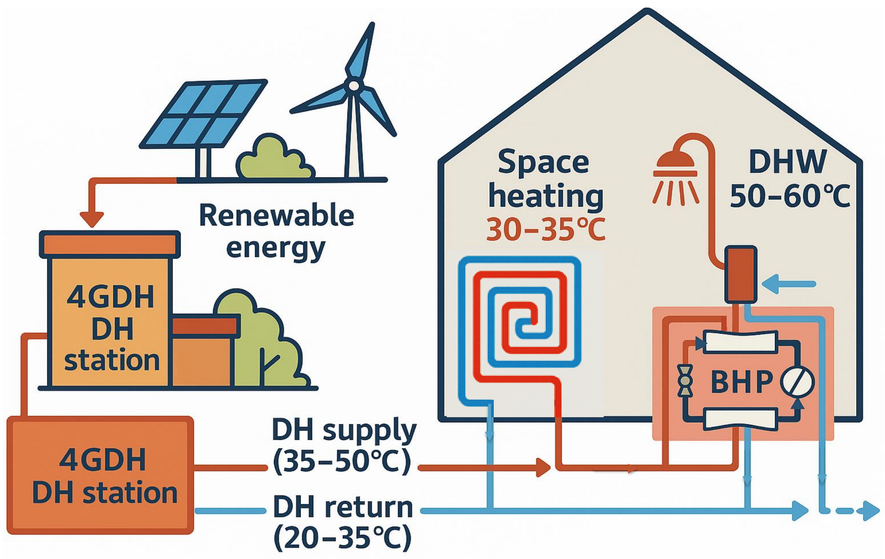
Highlights

1. Drop-in application of zeotropic mixtures in heat pump systems and its temperature glide behavior.
2. Heating capacity and COP improvements with zeotropic mixture refrigerants are demonstrated.

- EU Regulation No. 517/2014 phases down high-GWP HFCs, driving the need for sustainable refrigerants.
- Zeotropic mixtures with natural components such as HFO, HC, R290 and CO_2 exhibit temperature glide, allowing better temperature profile matching, reduced exergy losses, and higher COP. This work explores the thermodynamics and performance of such sustainable mixtures to enhance the efficiency and applicability of next-generation heat pump systems.



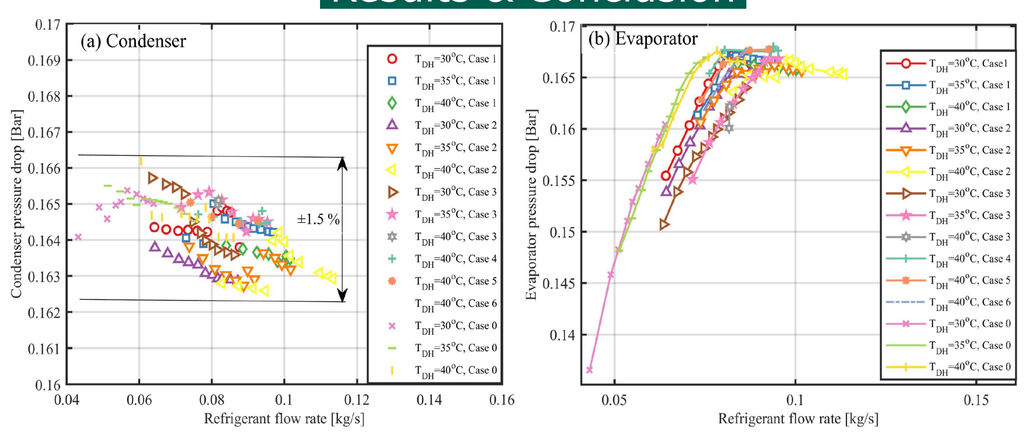


Question addressed

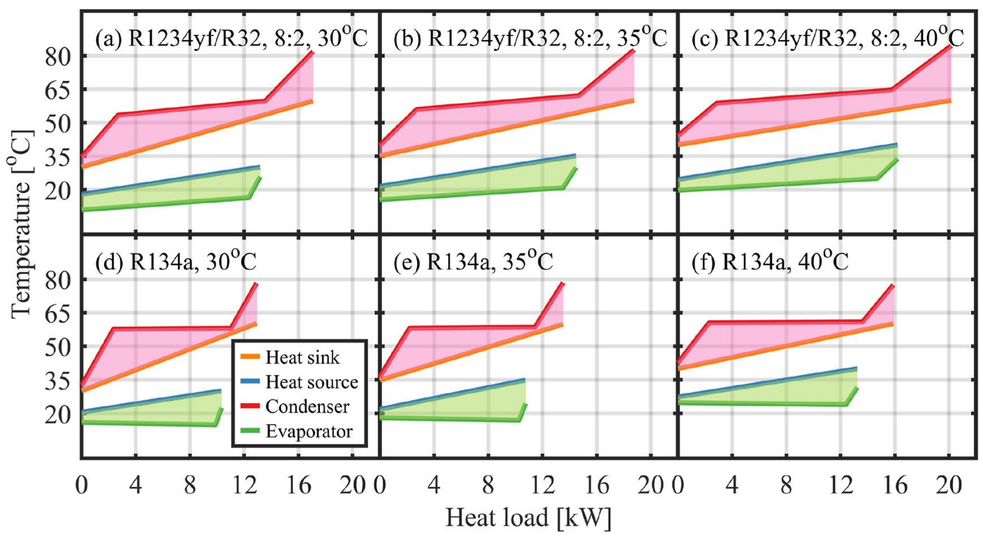
Answer: What is the thermal behavior and exergy performance of the studied zeotropic mixtures heat pump in district heating network application?

Address the gap by conducting an experimental validation-based feasibility analysis of R-1234yf/R-32 zeotropic refrigerant mixtures as a drop-in replacement for R-134a.

Results & Conclusion



Pressure drop data results



R-1234yf/R-32 (80%/20%), Higher COP at lower temperatures; Up to 58% heating capacity improvement over baseline. **Our study shows that zeotropic refrigerant mixtures can regulate temperature glide and enhance heat pump performance in ultra-low-temperature district heating.**

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More information on Advanced Heating and Cooling Sustainable Heat Pump Technologies

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