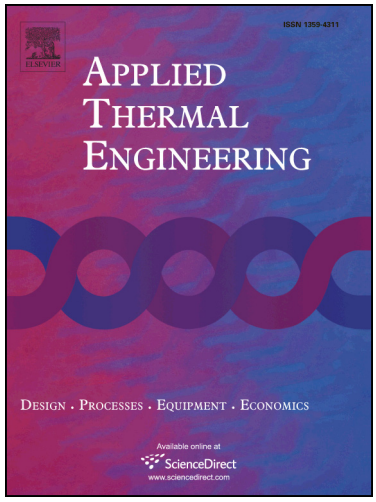

Research Paper

Screening of working pairs for adsorption heat pumps based on thermodynamic and transport characteristics

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SCREENING OF WORKING PAIRS FOR ADSORPTION HEAT PUMPS BASED ON THERMODYNAMIC AND TRANSPORT CHARACTERISTICS

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ABSTRACT

Screening analyses based on thermodynamic and heat transfer principles are conducted for adsorption heat pumps to enable the comparison of working pairs on the basis of common figures of merit. After a broad survey of working pairs in the literature, 110 are analyzed for cooling mode operation, while 81 are analyzed for heating mode operation. The analyses are conducted at operating conditions based on American Heating and Refrigeration Institute (AHRI) standards. Working pairs with ammonia as the refrigerant and activated carbon as the adsorbent are found to perform well in the heating mode and yield compact systems for both modes. Certain activated carbon + ethanol working pairs are found to perform well in the cooling mode, and some metal-organic framework + ethanol pairs perform well thermodynamically in heating mode. Based on these assessments, working pairs are recommended for both modes.

KEYWORDS

Adsorption, working pairs, heat pump, screening