

Accepted Manuscript

A novel chemical heat pump cycle for cooling and heating

Chunhuan Luo, Changchang Yang, Yichan Zhang, Zerong Xing, Yuanying Zhang

PII: S1359-4311(18)32038-6
DOI: <https://doi.org/10.1016/j.applthermaleng.2018.08.019>
Reference: ATE 12522

To appear in: *Applied Thermal Engineering*

Received Date: 1 April 2018
Revised Date: 30 June 2018
Accepted Date: 5 August 2018

Please cite this article as: C. Luo, C. Yang, Y. Zhang, Z. Xing, Y. Zhang, A novel chemical heat pump cycle for cooling and heating, *Applied Thermal Engineering* (2018), doi: <https://doi.org/10.1016/j.applthermaleng.2018.08.019>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



A novel chemical heat pump cycle for cooling and heating

Chunhuan Luo^{*1,2}, Changchang Yang¹, Yichan Zhang¹, Zerong Xing¹, Yuanying Zhang¹

¹ School of Energy and Environmental Engineering, University of Science and Technology Beijing, 30 Xueyuan Road, Haidian District, Beijing 100083, China

² Beijing Key Laboratory of Energy Conservation and Emission Reduction for Metallurgical Industry, Beijing, 100083, China

Abstract: The absorption heat pump cycle based on LiBr/H₂O has shortcomings of easy crystallization, severe corrosion, and the limitation in the temperature rise. In this study, a novel chemical heat pump cycle is proposed to overcome these issues. The thermal performance of the chemical heat pump using NaNO₃/H₂O is simply calculated for communication. The results show that the chemical heat pump can work at a lower generating temperature of 73.9 °C and avoid the crystallization issue when simultaneously supplying heating and cooling at 60 °C and 7 °C, respectively. Moreover, the annual corrosion rate of carbon steel in the NaNO₃/H₂O strong solution is only 7.09 μm y⁻¹ at 180 °C. The chemical heat pump has the advantages of lower generating temperature and corrosiveness, as well as larger temperature operating range and temperature rise in comparison to the absorption cycle using LiBr/H₂O and other alternative working pairs. However, the chemical heat pump has a lower thermal performance, and the COP_c , COP_h , and COP_o are 0.11, 1.11, and 1.22, respectively. In the future studies, it is expected that the chemical heat pump will achieve a much higher COP , after taking into account of a multiple-effect cycle, as well as a chemical refrigerant with a larger dissolution enthalpy and solubility slope.

Keywords: Chemical heat pump; chemical refrigerant; thermodynamic properties; thermal performance

Corresponding author.

* Tel.: +86 10 62333682; fax: +86 10 62333682. E-mail address: luochunhuan@ustb.edu.cn

Download English Version:

<https://daneshyari.com/en/article/8941915>

Download Persian Version:

<https://daneshyari.com/article/8941915>

[Daneshyari.com](https://daneshyari.com)