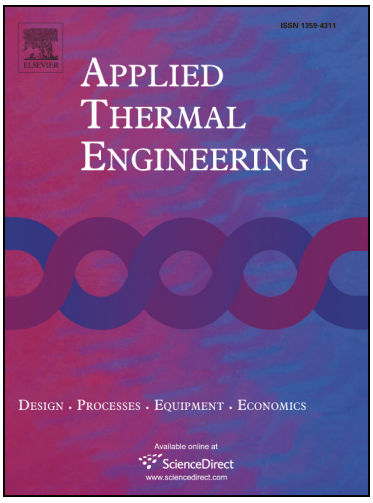

Adsorptive transformation of ambient heat: A new cycle

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ADSORPTIVE TRANSFORMATION OF AMBIENT HEAT: A NEW CYCLE

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Abstract

In this communication, a new adsorptive cycle for upgrading the ambient heat is suggested and briefly analyzed. The main feature of this cycle is that regeneration of adsorbent is performed by dropping the vapour pressure over adsorbent at a constant temperature, rather than by adsorbent heating as usual. This pressure drop is ensured by low ambient air temperature and does not need the supply of energy that has commercial value. It is essential that the regeneration is easier at colder ambient. Since the useful heat that gains commercial value is obtained by means a low ambient temperature, the new approach is called "Heat from Cold" (HeCol). It can be interesting for countries with cold climate, and especially for the Arctic zone.

Key-words: heat transformation, heat storage, thermodynamic cycle, renewable energy, environment, adsorption

INTRODUCTION

The greenhouse gases emission and global warming are one of the most important environmental concerns [1]. The world community has realized the gravity of these problems and taken initiatives to alleviate or reverse this situation. Fulfilment of these initiatives requires the replacement of fossil fuels with renewable energy sources (Sun, wind, ambient heat – natural water basins, soil, air, etc). These new heat sources have significantly lower temperature than that achieved by burning fossil fuels which opens a niche for applying adsorption technologies for heat transformation [2].

By now, the adsorptive heat transformation (AHT) has made spectacular progress, and several adsorptive chillers/heat pumps have already appeared in the market [3, 4]. These units are commonly driven by a temperature difference between the ambient (280-310K) and an external heat source (330-450K) which is used for adsorbent heating and regeneration. In this communication, we consider the possibility to use for heat upgrading the tem-