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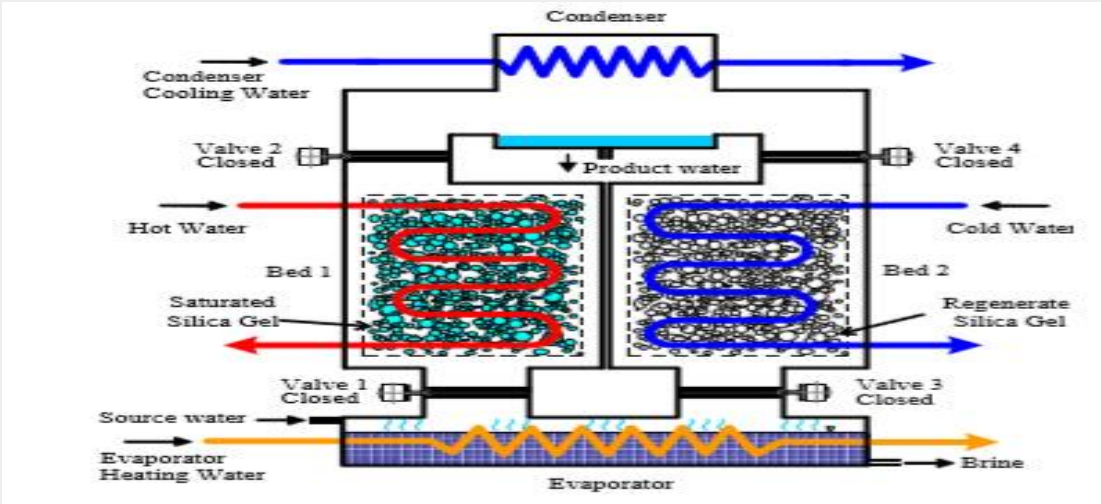
Interested in following up on what is new in the field of water desalination and contributing to its development through reverse osmosis and adsorption technologies.

Comparing the Performance of Three Adsorption Materials (HKUST-1, CPO-27(Ni) and Type-A^{++}) to Improve Adsorption Desalination



" Fig. 1 Adsorption desalination diagram for two-bed (Wu 2013)"

Keywords: Adsorption, Metal organic frameworks, CPO-27 (Ni), HKUST-1, Silica gel, Type-A++, Thermos-physical properties, isosteric enthalpy, Activation energy.

The desalination of water has proved quite important to meeting the water shortage; it has been in use in the Middle East for a while due to the long-standing water crisis there. Four of the most widely acclaimed water desalination technologies include multistage flash, multi-effect distillation, mechanical vapour compression and reverse osmosis. However, there is a common disadvantage with all these techniques that is their lack of efficiency in power consumption, which often increases the amount they each use. Recently, the proposed technique for alleviating the water crisis is the adsorption-desorption desalination (Wang et al. 2008). The development of adsorption desalination technology is set to advance the technology of water desalination by using less electrical energy and improving the quality of fresh water that results from the process. Moreover, CO2 emissions are reduced. Surprisingly,

the general cost of water production also decreases significantly. A few notable features of the adsorption desalination plant that sets it apart from conventional methods are described below:

- Adsorption desalination uses readily- available waste- heat of industrial processes that are easy to access in strainers.

- such as minimal costs and the easy availability of resources as well as since the temperature requirement of this method is relatively low compared to absorption systems, there is a lower

chance of corrosion. In addition, the proposed mechanism allows cold air to be released to serve as air-conditioning (Wu, Hu & Biggs 2012).

In this regard, there are numerous materials being used for the process; silica gels and MOFs are being researched to determine their benefits when compared to other materials

Thus, the important role of adsorbent materials in the desalination process is their ability to adsorb high-water steam from the saline or brackish water source after being heated through their high surface areas (Wu 2013).

Type-A++ silica gel is used as adsorbents in cooling systems due to its superior performance. However, metal organic frameworks a new material - has been found to have the potential to outperform silica gel. Since there has been limited research to define the properties of metal organic frameworks (MOF) being used in the adsorption-desorption desalination process, this paper investigates the properties of two MOFs, HKUST-1 (also known as Cu-BTC (copper benzene-1,3,5-tricarboxylate)) and CPO-27(Ni) (also known as MFO-74(Ni)). It also looks into the characteristics of type A++ silica gel and compares it to that of the MOFs. Three materials were compared based on their most important thermo-physical properties uptake capacity of water vapour, regeneration temperatures, activation energy, and isometric enthalpy. These will significantly contribute to choosing the optimum type of material improve the efficient adsorption desalination process. Thus, this project used a systematic literature review focussing on recent articles to obtain accurate and consistent data. The results indicated that HKUST-1 has superior absorbance when compared to the other two materials. The potential of HKUST-1 to adsorb water can be utilized in cooling mechanisms and desalination processes. CPO-27(Ni) has a high-water uptake potential, while type-A++ silica gel has the lowest. The results highlighted in the study indicate the relevance of MOFs in adsorption desalination and cooling systems.

References:

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Wu, J.W., Hu, E.J. & Biggs, M.J. 2012, 'Thermodynamic cycles of adsorption desalination system', *Applied energy*, vol. 90, no. 1, pp. 316-22.