Green synthesized transitional metal doped aluminum fumarates for adsorption heat pump applications

Tahmid Hasan Rupam

Doctoral Student, International Institute for Carbon-Neutral Energy research (I2CNER), Kyushu University, Fukuoka, Japan

Adsorption cooling system works analogous to the most commonly used vapor compression system. Both the systems provide cooling or heating by utilizing the phase change of the refrigerant material. Adsorption cooling systems are environment friendly and are driven by low grade heat energy usually collected from industrial waste heat or solar thermal energy. Therefore, adsorption heat pumps are thought to be one of the most potential alternatives to the energy intensive vapor compression systems. However, the current adsorption heat pumps suffer from various drawbacks which includes bulky size, high installation costs, low thermal efficiency, etc. Almost all these drawbacks can be minimized to an acceptable level if the adsorption isotherm's shape can be modified to a desirable one. It is now well established that for heat pump systems, the S shaped adsorption isotherms are the most suitable ones as they can offer the highest net uptake in the heat pump's working pressure region (Fig. 1 (a)). The isotherm of water adsorption on several metal organic frameworks takes the form of an S shape and hence there has been a lot of interest among the researchers in working with MOF/water pairs in recent times. One of the potential MOFs for adsorption heat pump is aluminum fumarate. In this talk, we will discuss about the green synthesized transitional metal doped aluminum fumarates for adsorption heat pump applications.

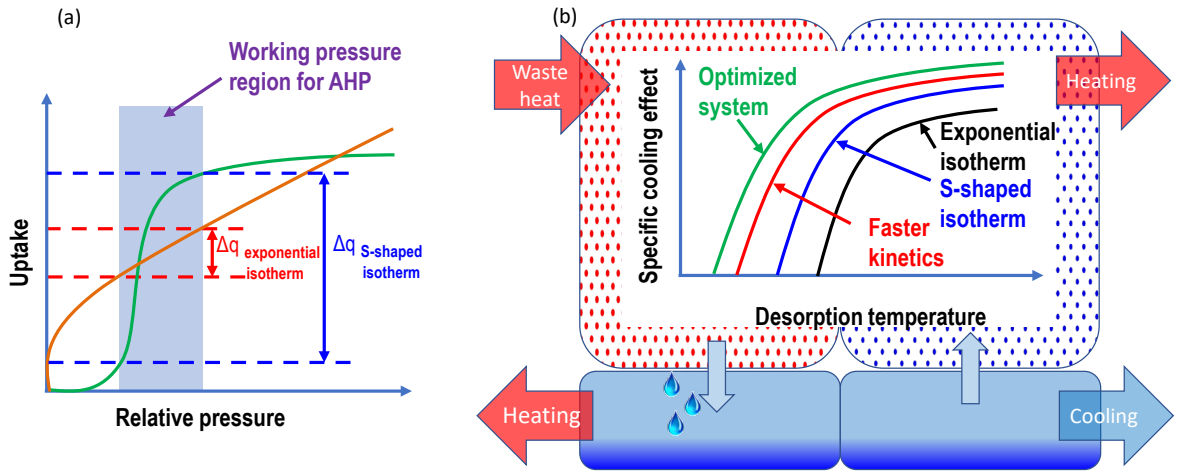

Fig. 1. (a) Effect of S shape isotherm on net uptake, Δq, (b) effect of S shape isotherm on system performance.