Multiscale approach for thermally driven adsorption systems

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ABSTRACT: Large quantity of fossil fuel is consumed for domestic and industrial cooling/heating applications which results in significant amount of CO_2 emission in the process. Thermally driven adsorption systems are capable of reducing a considerable fraction of this CO_2 emission by predominantly relying on low temperature waste heat instead of electricity for production of cooling/heating. However, such systems are known to be bulky and inefficient limiting their practical implementation. In order to address this issue, research investigations need to be carried out on multiple scales: i) development of newer adsorbents with higher uptake and heat transfer capabilities ii) optimized design of adsorption/desorption heat exchangers for improved mass transport and thermal efficiency iii) understanding the overall dynamics of adsorption systems and their optimization on a system level. The present talk will provide an overview of the combined experimental, theoretical and computational efforts being carried out by our research group in the above mentioned directions. The aim is to improve our overall understanding of adsorption science and technology which can lead to compact, highly efficient practical cooling/heating systems thereby paving a path for carbon-neutral society.